NATIONAL SECURITY AGENCY
FORT GEORGE G. MEADE, MARYLAND 20755

ODP #9-1765

24 May 1979
COINS/099-79

MEMORANDUM FOR DISTRIBUTION

SUBJECT: Final Report from Information & Communications Applications, Inc. (ICA)

1. Enclosed is a two-part report from ICA entitled Problems Associated with Accommodating Interactive Hosts in COINS II, dated 10 May 1979. Please convey my thanks to the many individuals in all of the organizations concerned who provided valuable assistance to ICA in the development of this report. The main objectives of this report are to provide managers at all level in the community with:

a. Some basic, factual information on the current and future status of interactive operations within COINS II, including the associated problems.

b. An indepth assessment of the situation as viewed by the contractor (i.e., ICA's findings and recommendations).

2. Remember, the conclusions and recommendations of this report do not necessarily represent the views of either the COINS PMO an any one of the participating agencies. It is recognized that each agency taking the same set of facts may draw a completely different set of conclusions and recommendations.

3. As indicated in this report, there is a number of ongoing activities which could significantly increase the overall usage of COINS II. This increase should begin with the connection of NPIC/NDS and NSA/PROJECTOR to COINS II in FY-80. Further, the COINS PMO, in cooperation with each of the following agencies, has completed the first draft of a plan on what would be required to connect its system to COINS II.

a.	CIA/ISC	Installation of a TAS in the Information Science Center (ISC) at CIA School.
b.	NAVINTCOM/NOSIC	Connection of SEAWATCH using a Network Access System (NAS).
c.	NMIC	Connection of NMIC Support System (NSS) using a NAS.

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d.	STATE/INR	Installation of a NAS to permit INR terminals to have access to COINS II and set the stage for connecting State's Automated Document System (ADS) to COINS II.
e.	NSA/NSOC	Installation of two TAS's to permit the 64 terminals in NSOC to have on-line access to COINS II as well as TIDE/PREFACE.
f.	DOE/LLL	Installation of a TAS to permit terminals in the intelligence compartments of LLL, Sandia and Los Alamos to have access to COINS II and later to connect in a host processor (i.e., H3000).

3. The attached report assumes that all of the above organizations will concur in the first draft report and will be moving toward establishing a connection to COINS II in the near future. Since none of these organizations has yet concurred, it is difficult for the COINS PMO to develop any form of meaningful plans for the future because it takes approximately 18-24 months to connect a system to COINS II once the host agency and COINS PMO concur in a plan and the necessary resources are provided.

4. This report indicates what appears to be an alarming increase in the number of remote terminals requiring interactive access to host systems in COINS II over the next few years. In one respect, the impact of these figures is mitigated by the fact that COINS, IDHSC and PLATFORM do not have an agreed upon set of specifications for a network virtual terminal (NVT). Therefore, many of the existing terminals identified in this report can not work with all existing systems in COINS II (e.g., TTY Model 35's, TTY Model 37's, can not work with the NSA/SOLIS system). CSC is now under contract to the COINS PMO to draft a set of specifications for an NVT for consideration by COINS, IDHSC and PLATFORM.

5. With respect to ICA's Recommendation No. 6, the COINS PMO currently has FEDSIM under contract to develop a simulation model of the UNIX-based Terminal Access System (TAS). This effort is aimed at providing the COINS PMO with an independent assessment of the TAS. Initial results are expected in the last quarter of FY-79. However, at this time, it is believed that the TAS can accommodate in excess of 32 interactive connections concurrently.

6. Tentative thinking is to have this ICA study reviewed and updated each year. However, the COINS PMO plans to use this report to support several other COINS PMO ongoing efforts. For example:

a. Network Virtual Terminal Specifications - A copy is being provided to CSC for use in its effort to develop a draft specification for an NVT to be considered by COINS, IDHSC and PLATFORM. CSC's report is due in the fourth quarter FY-79.

b. Secure Network Communications Subsystem (SNCSS) Plan - A copy is being provided to VanDyke Associates for use in the preparation of a long-range plan for the SCNSS for COINS II. This report is due in the 4th quarter FY-79.

c. Traffic Flow Analysis - A copy is being provided to Informatics, Inc. to develop some estimates on the number of characters, packets and interactive connections that can be expected to be handled into and out of each host, TAS, gateway, front-end, etc. Informatics already has several years of historical statistical information available which can be used in developing past traffic flow which can be used to project traffic flows to be expected in the future.

7. The critical questions each agency should ask itself with respect to each host and associated FEP, gateway and terminal system connected to COINS II are:

a. How many concurrent interactive connections must my system support to service my users?

b. How many concurrent interactive connections can my system support from COINS II which are in addition to its internal support requirements.

c. How will competition between internal and external users for scarce resources in the host be resolved?

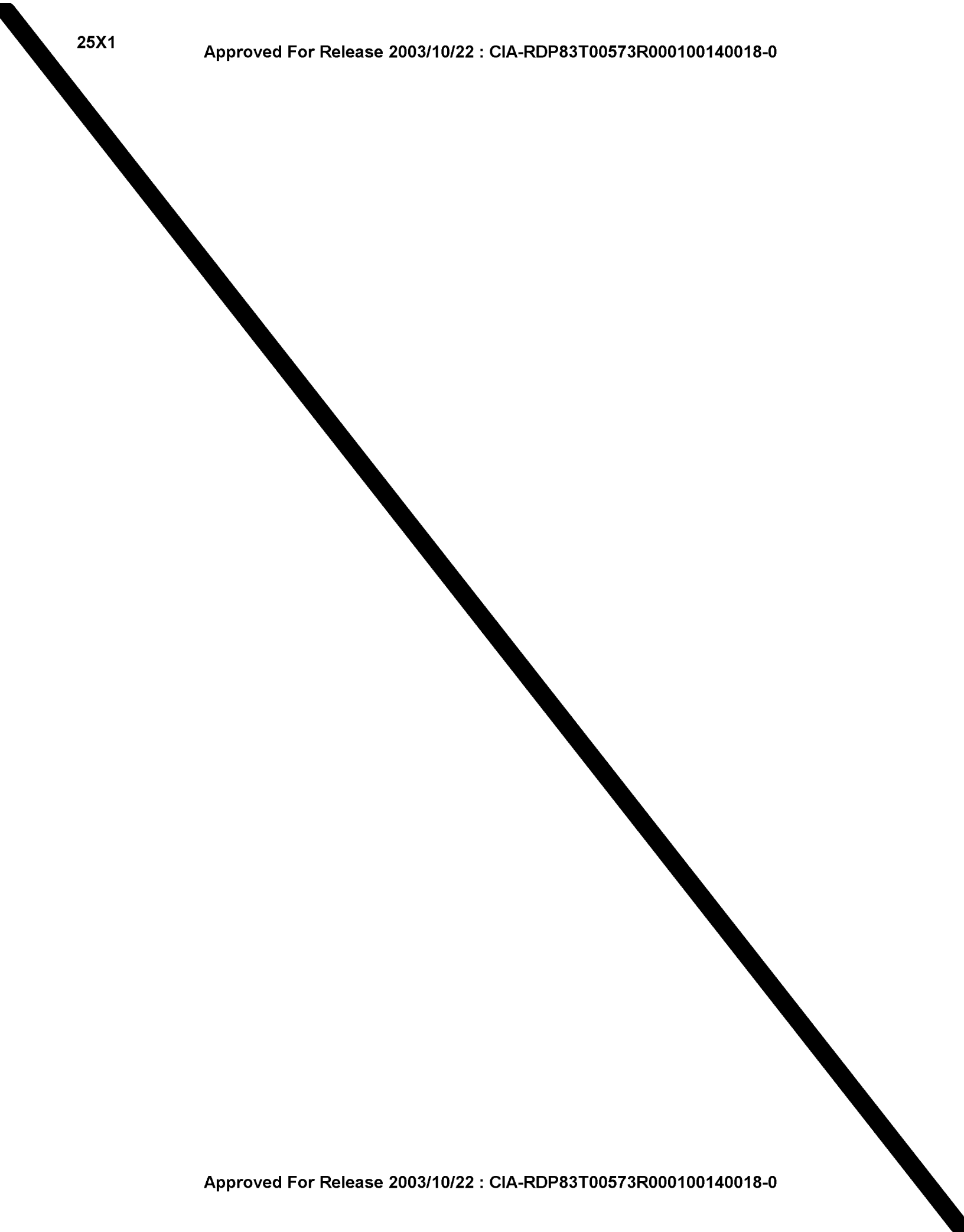
8. I would appreciate your views on the ICA report, particularly with respect to its findings and conclusions. I would also appreciate any corrections, deletions or additions to the basic report that you may have.

25X1

[redacted]
COINS Project Manager

Enclosures
a/s

DISTRIBUTION
CIA COINS Subsystem Manager, Mr. [redacted] 25X1A
DIA COINS Subsystem Manager, Mr. [redacted] es)
NPIC COINS Subsystem Manager, Mr [redacted]
NSA COINS Subsystem Manager, Mr. [redacted]
State COINS Subsystem Manager, Mr. William Berry, INR/RCI (1 copy)



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1.0 INTRODUCTION

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(U) The Community On-Line Intelligence System (COINS) is progressing through a number of evolutionary changes as technology advances in the data processing and data communications fields. The Intelligence Community's future requirements are dictating a need for more interactive host systems. Currently, the NSA/SOLIS (a Burroughs 7700 Computer) system is the only interactive system operating in COINS II. This is presenting problems for batch mode terminals in that only agencies in the intelligence community having a remote terminal on the Terminal Access System (TAS) can access the SOLIS system.

(U) Some of the Community agencies associated with COINS are implementing plans to replace their operational batch mode computers with interactive computer systems. Other agencies desiring access to COINS II are implementing plans for installing Terminal Access Systems as the front-end system between users of the COINS II network and its subsidiary application. To meet their future requirements for accessing COINS II, there are other agencies in the intelligence community that are associated with other networks and contemplating "GATEWAY" implementation between COINS II and their specific network.

(U) These Community programmed changes have caused the COINS PMO to request a study of the problems associated with accommodating interactive hosts in COINS II. The purpose of this study is to identify some of the potential problem areas that need to be addressed and to provide the COINS PMO and other user managers with information for planning purposes. This report will:

- Discuss host processors and their methods of handling interactive operations.
- Project the terminal population capable of operations in the interactive mode.
- Discuss GATEWAYS and the number of concurrent interactive connections the COINS PMO should plan to accommodate.

(U) Section 2 provides an overview of the COINS network and those intelligence community programs scheduled or projected for implementation over the next five years. The number of terminals associated with each of these programs has been included to project the growth in terminal population capable of interactive operations in the COINS II network.

(U) Section 3 presents a brief description of each host system, existing or future, and its associated front-end processor.

(U) Section 4 provides a brief discussion on three special host systems.

(U) Section 5 presents the findings of this study.

(U) The final section presents ICA's recommendations.

(U) In performing this study, several assumptions were agreed on:

- COINS II will be operating in the Washington, D.C. area through FY 1985.
- COINS II will have a number of GATEWAYS to a number of different networks to extend service outside the Washington, D.C. area.

- A number of additional hosts (including Terminal Access System) will be added to COINS II over the next six years (through FY 1985).
- COINS must be capable of handling 10 percent of the total interactive capability during peak periods or crisis situations.

2.0 COINS OVERVIEW

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2.1 COINS I

(U) The original COINS Network (COINS I) was designed as a store-and-forward star-shaped network for intercomputer communications. COINS I consisted of a set of host computers tied together by a switch (IBM 360/30 and later a PDP 11/70). Figure 2-1 illustrates the basic configuration. The secure communication between the host computers was via the switch located at the DIA Arlington Hall Station.

(U) The COINS I Network was accessed via terminals (or peripheral devices) supported by the host computers of the network. There was no access other than through a host computer of COINS I. The interface between terminal and network was the specific host computer itself.

(U) The network software for COINS I consisted of (1) the network interface in each host; (2) routing software in the switch; and (3) data reduction software for the Network Management Information System (NMIS). The only protocol defined was the set of data formats and control commands required for transmission to the switch.

(U) Since each host and their associated terminals were in a secure location with cleared personnel, access from the network was assumed by the destination host to have been authorized at the source.

(U) COINS I operated in a batch mode. A query was submitted and after an indefinite time period, it was responded to by an answer.

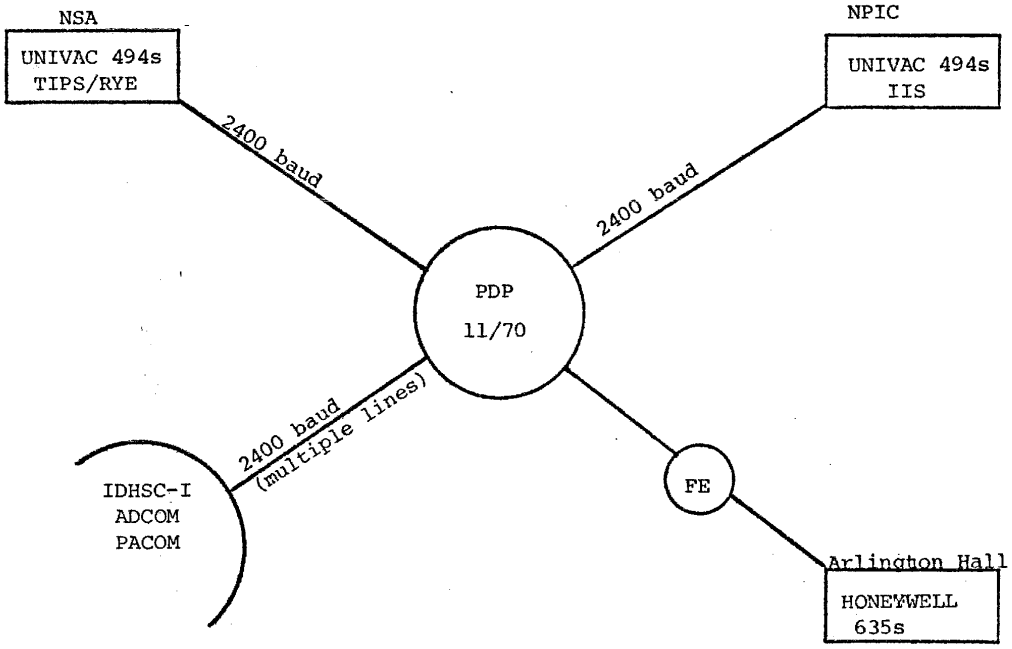

Figure 2-1. COINS I Network

The protocol designed for COINS I had the following form:

- The data transmission unit was a segment of 150 characters.
- A message consisted of up to 350 segments.
- Message Types included interrogation, answer, and a variety of service messages for maintenance of control flow.

(U) Under the COINS principles of operation, a terminal user of a host in either COINS or IDHSC I entered an interrogation into his host system. After verification, the host system constructed and sent an interrogation message to the switch for subsequent forwarding to the addressee host. The host also forwarded a receipt to the user terminal.

(U) The switch, upon receiving the validated interrogation message, sent a receipt to the host and forwarded the interrogation to the addressee host. The addressee host also validated the interrogation message and sent a receipt to the switch. The same validation and receipt procedures were utilized for the answer message to the interrogation.

(U) Under the COINS I procedures, hosts and switches were instructed to forward traffic as far as possible in the network even though the destination host might not have been operating in the network.

(U) The switch kept certain key information in core and the message on disk storage until the message had been successfully transmitted and a receipt received. The amount of core storage available at the switch for use often became saturated in cases of

communication line troubles, inactive host facilities, or during unusually high levels of activity. The software within the switch would sense that the switch was becoming overloaded, and it structured an ALARM message and sent it to all host systems.

(U) Because of those procedures, the hosts and the IDHSC I switch at DIA, (the switch in PACOM was also included), had a capacity to hold large amounts of "batch" traffic for distant hosts.

2.2 PRESENT COINS (I AND II)

(U) In 1974, an upgrade program was initiated and actions begun to transform the COINS I store-and-forward network into the COINS II packet switched network. The COINS II subnet is based on ARPANET technology. A set of Interface Message Processors (IMP) are interconnected via 64 kilobaud channels. Each IMP (Honeywell 316 Computer) is connected to at least two other IMPs in the network. These IMPs (presently five) perform the following functions:

- Routing of data packets from the remote source to the remote destination;
- Support up to four local host computers via a standard host interface;
- Monitoring and diagnosing the condition of connections to other IMPs and forwarding diagnostic data to the Network Control Center (NCC); and
- Down-Line loading of software to the IMPs on command from the NCC.

(U) Connecting a host computer to an IMP is a complex process that requires both physical and logical interfaces. The COINS II PMO has adopted as a policy the technique of using a front-end processor

as an intermediary between a host computer and the IMP to which it is attached. The front-end processor relieves the host computer of the burden of executing communications protocols. The COINS II front-end processor performs the following functions:

- Executes the Network Control Program (NCP) with reference to the IMP (COINS II SUBNET), and executes the initial connection protocol (ICP);
- Executes a procedure which matches its line and signal characteristics to the line and signal characteristics of the host input/ output system;
- Performs message reformatting and translation from one set of requirements to another.

(U) In the COINS II architecture, the term "host computer" does not necessarily mean a processing system which contains data files or a process capacity that is accessible via the network. Some of the COINS II hosts are only network accessing systems. The COINS Terminal Access System (TAS), as an example, is a concentrator for remote terminals and provides access to the network for those terminals. It is called a host because it executes all of the software protocols which a host is expected to execute. However, the TAS differs from some hosts in that it is attached directly to the IMP and does not have a front-end processor. Since it contains the NCP, it gives the appearance of a host to the IMP to which it is attached.

(U) The COINS network as it exists today is illustrated in Figure 2-2. In this and in other subsequent diagrams, the following descriptive elements are utilized:

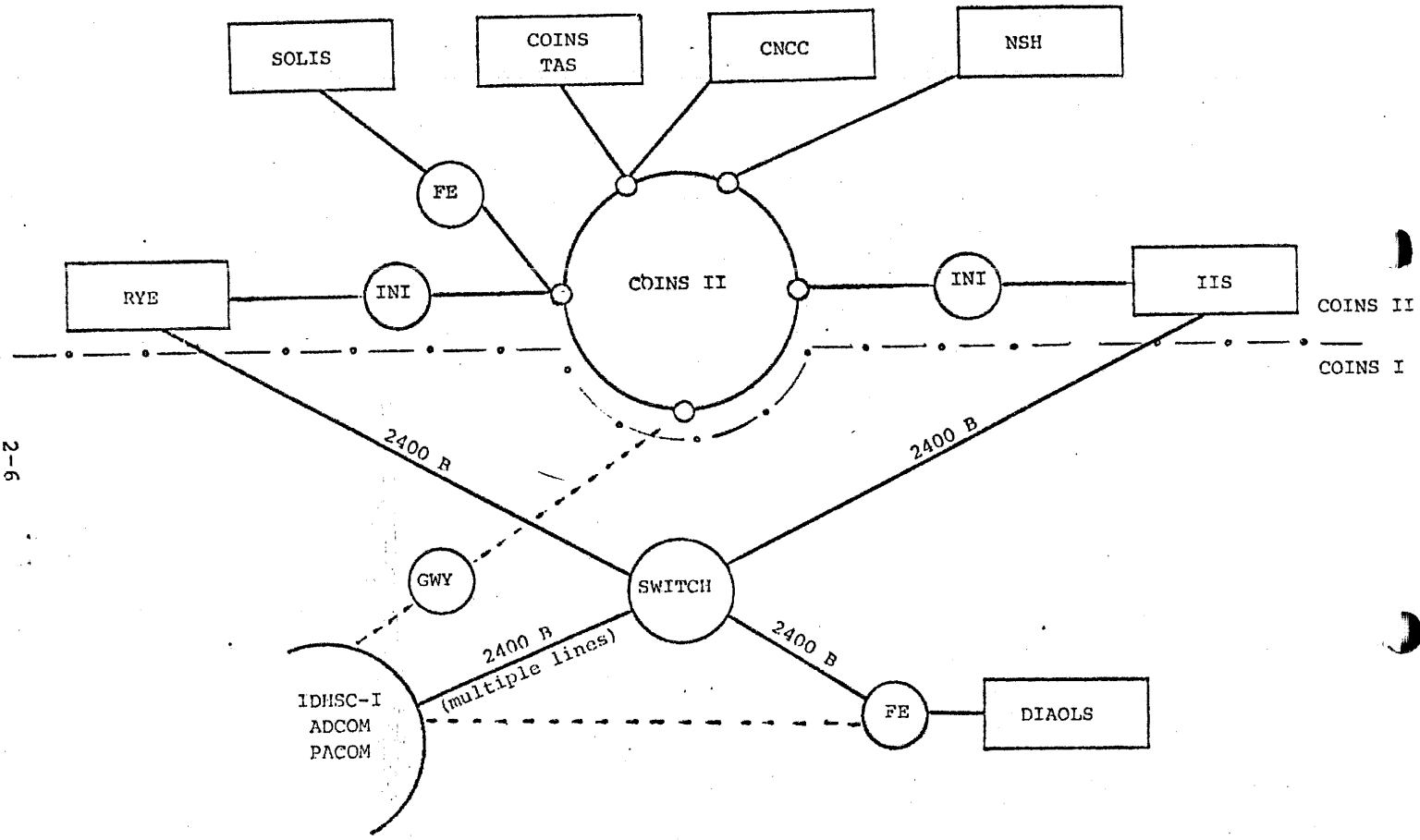

Figure 2-2. Present COINS Network

- A line indicates a communication link.
- The large circle represents the networks. The very small circles spaced around the large circle are processing nodes (COINS - IMPs).
- The other circles as designated indicate a Front-End Processor (FE or INI) or a GATEWAY (GWY).
- Host Systems are indicated by rectangles.

The large circle in the center of the diagram represents the COINS II subnet of IMPs and secure TETRADHEDRON 64 kilobaud links.

(U) Table 2-1 provides information on those COINS hosts that are shown in Figure 2-2.

(U) At the present time, the current COINS host facilities, as noted above, are batch oriented systems with one exception, the NSA SOLIS system. This host can only be interrogated by community users having a remote CRT terminal on the Terminal Access System (TAS). The existing TAS facility is located in the COINS PMO and provides a capability for 32 terminals.

(U) Initially, the TAS was intended to provide remote terminal service to those organizations that did not have a host operating in COINS. However, due to the delay in the COINS II/IDHSC connection, the COINS PMO has offered DIA a contingency plan whereby TAS terminals will be installed in U&S Commands, Military Departments, and DIA spaces on an interim basis. These facilities will remain operational until DIA is able to provide the services through IDHSC II. The TAS has the necessary software to enable interactions with either batch or conversational hosts.

Table 2-1. Summary of Host Systems in Present COINS Network

HOST AGENCY	APPLICATION/SYSTEM ACRONYM	APPLICATION/SYSTEM HARDWARE	MODE OF OPN	TERMINAL TYPE	TERMINAL NUMBER	TERMINAL SCREEN OR LINE ORIENTED	FUNCTION	COMMENTS
NSA	SOLIS	B-7700	Interactive	S-8804 Super Bee's DD7000	117	Screen	SOLIS Operations	minals do not ss COINS II
NSA	TIPS/RYE	U-494	Batch	MOD-35 (87)	187	Line Oriented	Accessing COINS/up-dating files	rface COINS ubnet by INI, translates een COINS I COINS II
NPIC	ITS	U-494	Batch/ Interactive	Sanders 804 MOD 35	67 100	Line/Screen Oriented	Accessing (Batch only) COINS/ internal operations	4 804s itted to ss COINS II. rfaces COINS ubnet by INI.
DIA	DIAOLS	H-635	Batch/ Interactive	MOD-37	100	Line Oriented	Accessing COINS/ IDHSC/internal operations	ractive bility for rnal terminal
NSA COINS PMO	TAS	PDP 11/70	Batch/ Interactive	MOD-40	32	Screen	Accessing COINS Hosts	
COINS PMO	NSH	PDP 11/70	Batch/ Interactive	MOD-40	16	Screen	TAS/USISS/ NUISS/TTRF	ides user management stance in
COINS PMO	CNCC	H-316		MOD-33	2	Line Oriented	Acts as the control point for the COINS II Network	cts, analyzes presents COINS twork perform- data
DIA	SWITCH	PDP-11/70	Batch				Store-forward switch in COINS I operations	TIPS/RYE other IDHSC tions connect- ia point-to- t circuits

2.3 FUTURE COINS II

2.3.1 Calendar Year 1979

(U) There are significant programs in the community that are scheduled for implementation in 1979. These programs will increase the growth in the number of remote terminals capable of accessing COINS II in an interactive mode and are briefly discussed below. Figure 2-3 depicts the COINS Network and host at the end of calendar year 1979. A summary of the estimated number of interactive terminals requiring access, and interactive access requirements by interfacing networks to the COINS II Network in 1979 are shown in Tables 2-2 and 2-3. Table 2-4 provides the COINS II capability of accommodating concurrent interactive users.

2.3.1.1 TAS

(U) The existing Terminal Access System has been modified to provide a capability of 32 terminals. Installation of the additional 16 remote terminal facilities has begun and is expected to be completed and operational by the end of the second quarter of 1979. Plans now exist to increase the terminal capability to 48 terminals. By the end of FY 80, the TAS should accommodate 64 terminals.

2.3.1.2 IDHS Interface

(U) During the second quarter of calendar year 1979, the interface between the COINS IMP at Arlington Hall Station and the IDHS node is to be completed. This will allow COINS II--IDHS I interaction through the IMP using the IDHSC switch (PDP 11/70) at DIA. Initially this interaction will continue to be in a batch mode using the process-to-process protocol from COINS I operations.

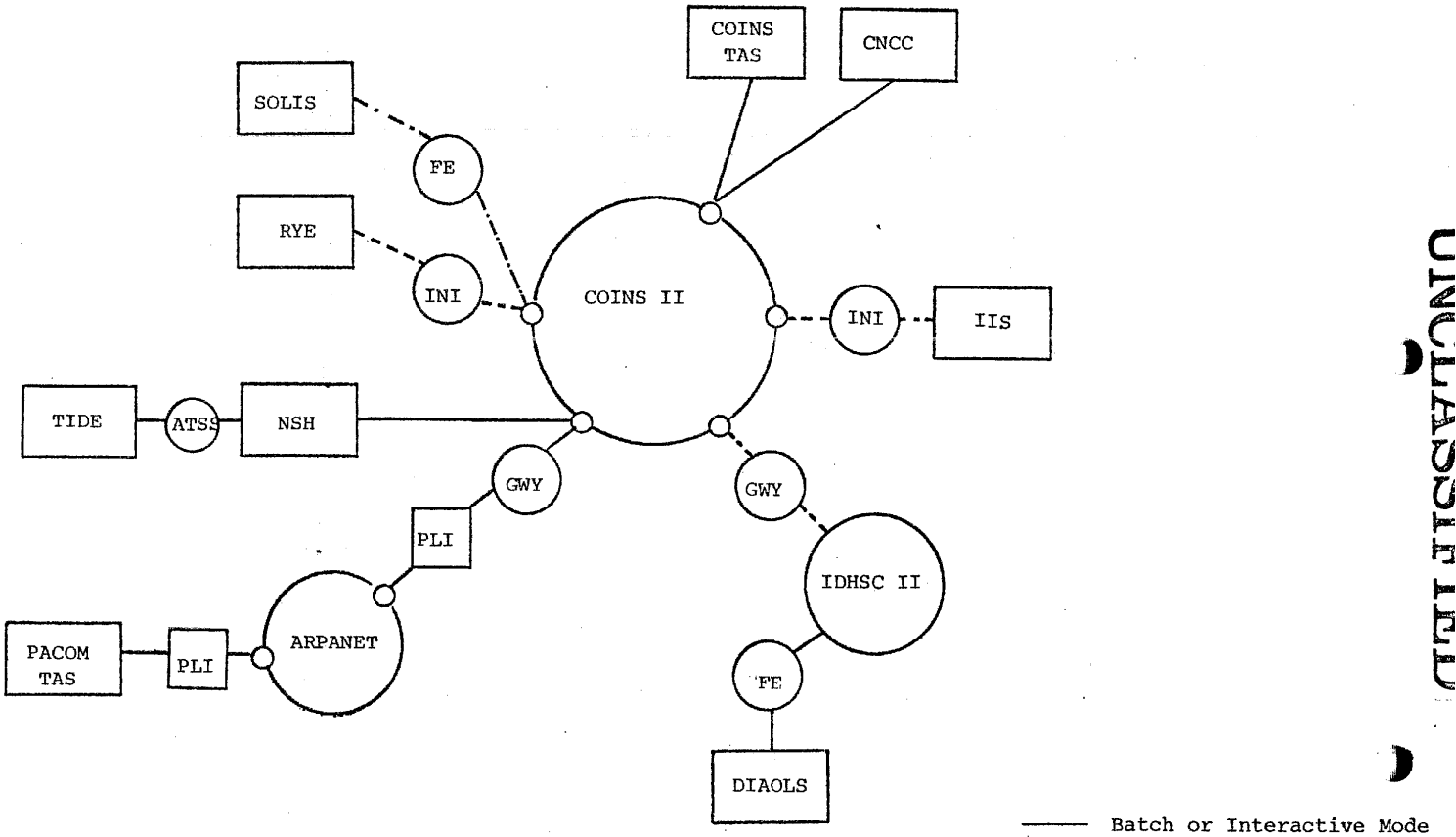

Figure 2-3. COINS Network Calendar Year 1979

Table 2-2. Summary of Estimated Interactive Terminals Requiring Access to COINS by Source Computer - 1979

Source	Terminals Available	Terminals Requiring Access	Concurrent Terminal Access Requirements
NSA SOLIS	110	0	0
COINS TAS	32	32	6
CINCPAC TAS	16	16	3
NSH	16	16	3
TOTAL	174	64	12

Note: In estimating terminal access requirements, it was assumed that 10% of the terminals associated with a host (having process capability) would have a requirement to access COINS II. It was further assumed that 20% of that 10% would require concurrent access to COINS II. In the case of the TAS type host, it was assumed that 20% of the terminals attached would require concurrent access.

Table 2-3. Summary of Estimated Interactive Requirements by Source Networks - GATEWAYS 1979

Source Network	No. of Terminals Requiring Access	No. of Terminals Requiring Concurrent Access	GATEWAY Concurrent Access Capability
ARPANET/COINS	16	3	20

Table 2-4. Estimated Concurrent Access Capability of COINS II Hosts and Gateway Facilities - 1979

Source (Host/Gateway)	CONCURRENT ACCESS CAPABILITY		
	Both Ways	To COINS Only	From COINS Only
NSA SOLIS	0	0	10
COINS/ARPANET	0	20	0
COINS TAS	0	32	0
NSH	0	32	0
TOTAL	0	84	10

(U) The DODIIS users will not be able to access an interactive system such as SOLIS until subsequent software improvements have been made in 1980. These software improvements will allow communications between the two networks in both batch and interactive modes.

2.3.1.3 COINS II/ARPANET CINCPAC Test

(U) The COINS/ARPANET test is also programmed to be initiated during the first quarter 1979. This test will involve linking the COINS II network in the Washington, D.C. area to CINCPAC using the existing ARPANET as a bridge. The existing ARPANET IMP at NSA will be connected to a COINS IMP at NSA via two intermediary devices: a Private Line Interface (PLI) and a "GATEWAY." The PLI performs text encryption and decryption between COINS and ARPANET, the GATEWAY performs the required internetwork address translations. A TAS and the necessary software are being installed at CINCPAC and the TAS will be connected to an ARPANET Terminal Interface Processor (TIP) in place at CINCPAC via a PLI. For this initial test there will only be six MODEL 40 terminals associated with the TAS. These terminals will be located in the various service intelligence centers in Hawaii. It is anticipated that a full complement of terminals (16) will be added to the CINPAC TAS by the end of calendar year 1979.

2.3.1.4 ATSS Verification Test

(U) The NSA Analytic Terminal Support System (ATSS) is one that supports the analytical elements in the NSOC, DEFSMAC, COC, DFAC, and other time-sensitive operations. ATSS is one of a number of "systems" that are interfaced to TIDE, basically a UNIVAC 494, which is the main time-sensitive systems processor, and which is undergoing various upgrades. TIDE manages the input and output, and does data processing and terminal support for the various

interfaced systems including ATSS clusters (TPU's); all in support of analytical, field, and user elements. ATSS is the main terminal system on TIDE. ATSS also operates with various forms of communications, including informal OPSCOMMs, and performs minimal data processing. There are now 12 ATSS clusters (TPUs) operating, supporting some 82 AUTOTERM CRTs in NSOC, DEFSMAC, COC, BROF, DFAC, AUTOLINE, and in one center remote from the NSA HQ building.

(U) The COINS PMO and the NSA V-Group have developed plans for dual connecting the ATSS Terminal Processing Units (TPUs) to both TIDE and COINS II. Verification tests are to be conducted in May 1979, or soon thereafter, utilizing one cluster (TPU) of 8 AUTOTERM 20 series CRT display devices in the NSOC. The TPU controlling this cluster of CRTs will be interfaced to the Network Service Host (NSH) located in the COINS PMO area. The connection to COINS will be via the NSH thus allowing that cluster of terminals access to all resources of the COINS II network. The number of remote terminals associated with the NSH will be increased to 16.

2.3.2 Calendar Year 1980

(U) Several programs to replace some existing batch retrieval systems at NSA and NPIC with interactive systems are scheduled for implementation. These programs, along with others that will expand the number of remote terminals capable of operating interactively with host systems in COINS II, are discussed below. Figure 2-4 depicts the COINS Network at the end of 1980. Table 2-5 provides a summary of the estimated interactive terminals requiring access to COINS II network by source computer at the end of the calendar year 1980. Table 2-6 provides a summary of estimated interactive access requirements by interfacing networks. Table 2-7 provides the COINS II capability of accommodating concurrent interactive users.

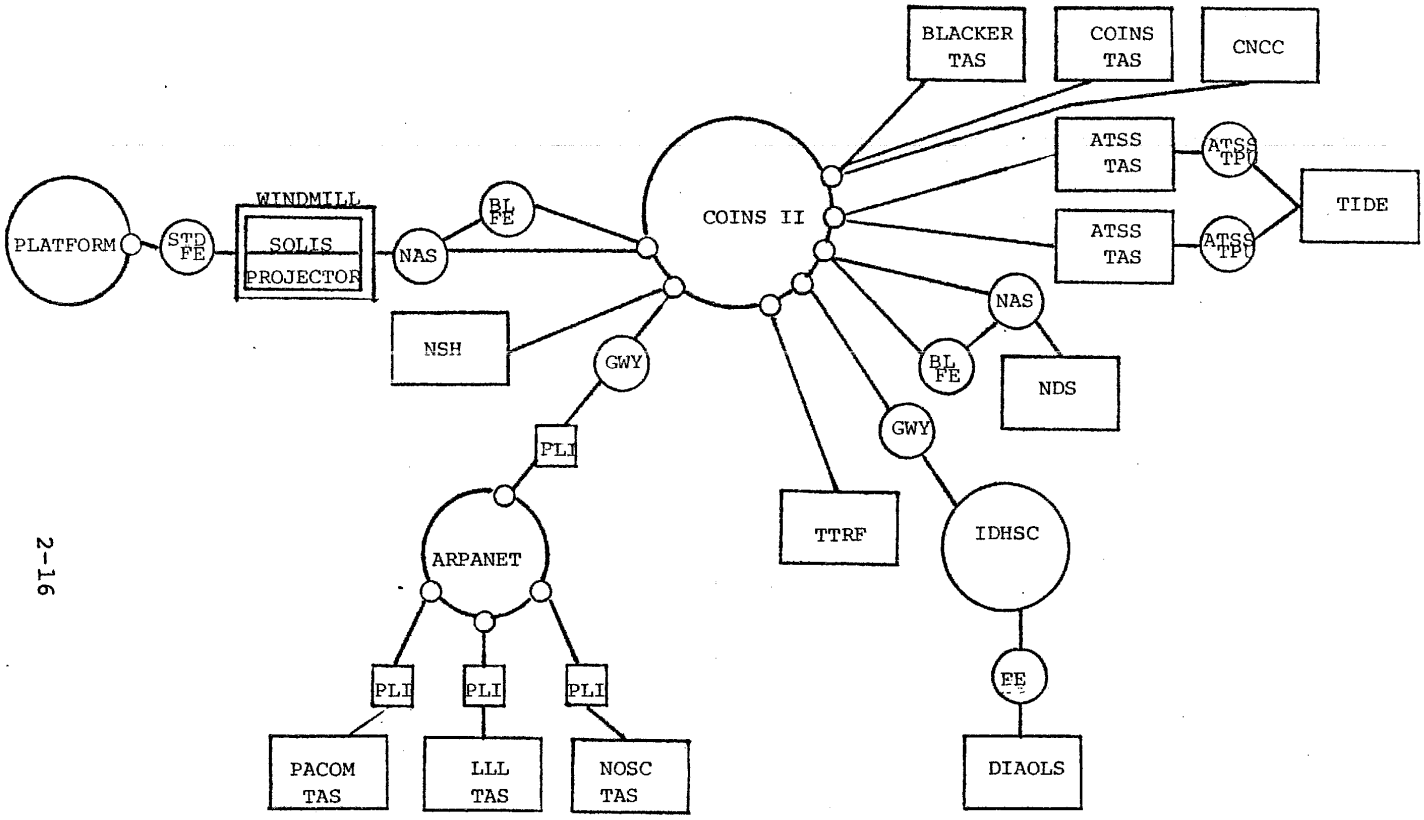

Figure 2-4. COINS Network Calendar Year 1980

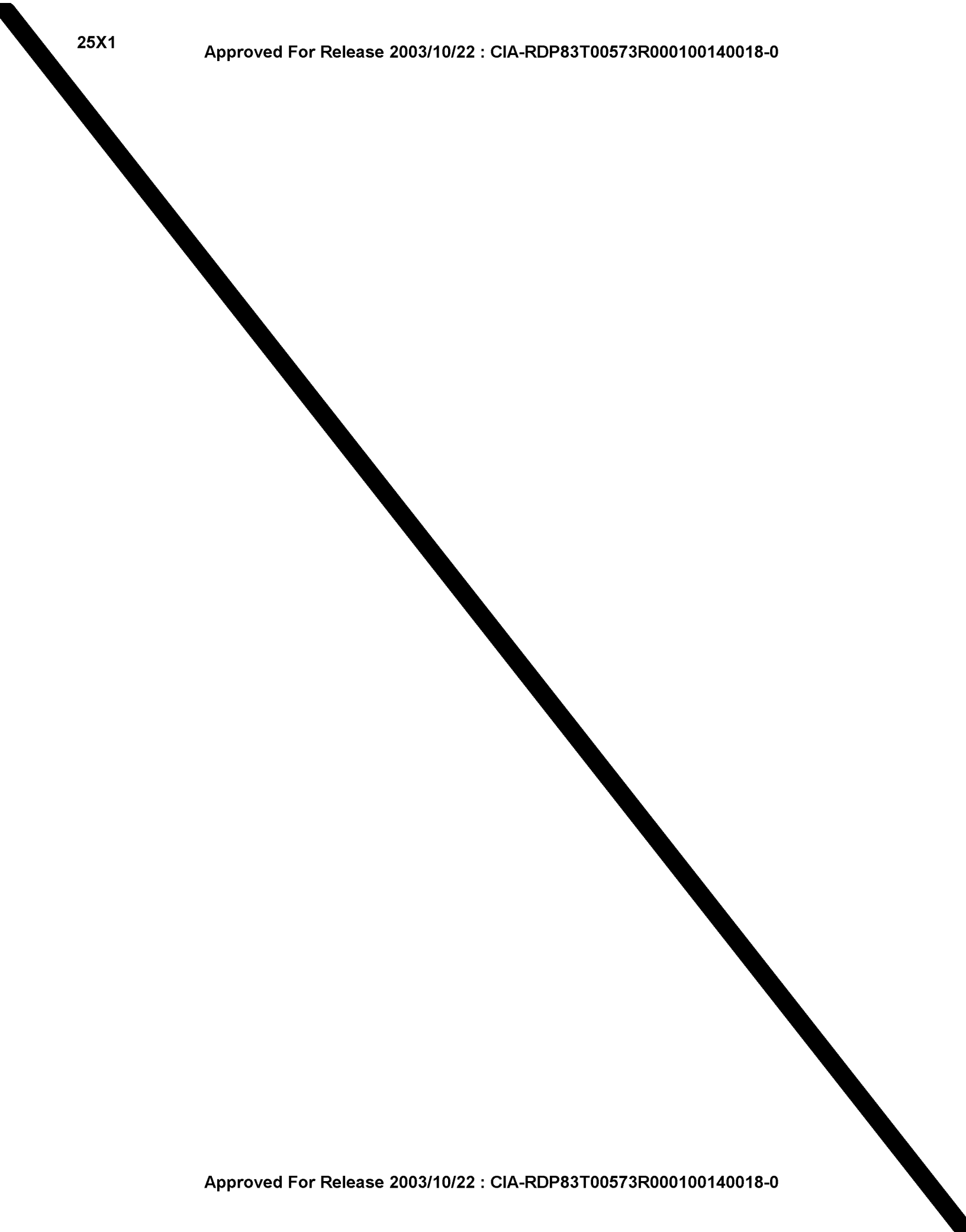

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Table 2-6. Summary of Estimated Interactive Requirements by Source Networks - GATEWAYS 1980

Source Network	No. of Terminals Requiring Access	No. of Terminals Requiring Concurrent Access	GATEWAY Concurrent Access Capability
ARPANET/COINS	96	19	20
DODIIS(IDHSC)/COINS	170	17	25

Table 2-7. Estimated Concurrent Access Capability of COINS II Hosts and Gateway Facilities - 1980

Source (Host/Gateway)	CONCURRENT ACCESS CAPABILITY		
	Both Ways	To COINS Only	From COINS Only
NSA WINDMILL	32		
NPIC NDS	42		
COINS TAS		32	
NSH	32		
TTRF		32	
ATSS TAS		32	
ATSS TAS		32	
COINS/ARPANET		20	
DODIIS(IDHSCII)/COINS	—	25	—
TOTAL	106	173	0

2.3.2.1 NPIC NDS

(U) During February 1980, the NPIC Data System (NDS) will be fully integrated into the COINS II network. This system, which has an interactive as well as a batch mode capability, would replace the present IIS System. The NDS will utilize the UNIVAC 1100/44 system with four processors, two input/output access units and four Communications Symbiont Processors (C/SP). There will be 476 Delta Data CRTs and several other terminal-like facilities attached to this system. The NDS will be interfaced to the COINS II network through a front-end device called a Network Access System (NAS). It will consist of a PDP 11/70, which will dynamically control the number of queries in the NDS system. The current plans provide for a maximum of 42 NDS/COINS connections as follows:

- COINS users interactively accessing NDS
- NDS users accessing COINS through the NAS
- COINS users accessing NDS in batch mode (one logical connection can handle all such traffic)

2.3.2.2 SOLIS/PROJECTOR And WINDMILL

(U) The NSA DDT organization is currently implementing plans to remove the RYE files from their existing host (TIPS/RYE) and to relocate to the existing SOLIS host machine, a B7700 called WINDMILL. The project name for this action is PROJECTOR. The resultant application will also be called PROJECTOR. The existing SOLIS application will continue to reside in WINDMILL and will only allow 10 concurrent COINS interactive transactions. The PROJECTOR application allows 32 concurrent COINS interactive transactions and is expected to be operational by the fourth quarter, 1979.

(U) The COINS PMO has proposed to interface the two applications on the WINDMILL host to COINS II and to interface the PLATFORM

network* to the two WINDMILL applications. WINDMILL will interface COINS II through a Network Access System (NAS), which is logically and physically connected to a COINS II IMP on the network side and to a Special Peripheral Control on the host side. The PLATFORM network will be physically and logically interfaced to the two WINDMILL applications through a PLATFORM IMP, a standard PLATFORM front-end (PDP-11/34), and a Special Peripheral Control. PLATFORM user terminals can access either application on the WINDMILL host. The WINDMILL terminals will also be allowed to access the PLATFORM network. The COINS PMO estimates that the PLATFORM linkage to the WINDMILL systems could be operational by the end of 1979. The non-NSA terminals will not have access to PLATFORM.

2.3.2.3 PACOM TAS Upgrade

(U) The TAS in Hawaii that is linking the COINS II Network to the Commander-In-Chief Pacific (CINCPAC) HQ through the existing ARPANET will be modified. It is estimated by COINS PMO that this TAS will be expanded to a 32 terminal system. This will provide the additional capability needed for expanded services in the Pacific Command Intelligence Community.

2.3.2.4 ATSS Dual Connection

(U) The NSA program to expand and improve the ATSS-40 program will be completed and the COINS PMO/V-Group plans for dual connecting of the ATSS Terminal Processing Units (TPUs) both TIDE and COINS II will be implemented through the installation of two TAS facilities

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* PLATFORM is an internal NSA packet switch network that utilized ARPA technology.

in the NSOC operating area. Eight TPUs, each supporting eight AUTOTERM CRTs, will be interfaced to each TAS, thus providing 64 AUTOTERM CRTs with the capability of accessing either TIDE or COINS.

2.3.2.5 Additional TAS Installations

(U) Several organizations within the intelligence community have expressed desires to interface the COINS II network. They are considering the installation of a Terminal Access System (TAS) with a full complement of 32 terminals. The COINS PMO cannot predict which of these organizations will install TASs during calendar years 1980 and 1981, but for the purpose of this study, we have selected two organizations for each year.

2.3.2.5.1 Lawrence Livermore Laboratories (LLL)

(U) Lawrence Livermore Laboratories (LLL) in California is considering methods of interfacing a TAS into COINS. If the COINS/ARPANET Test with CINCPAC is successful, they will probably exploit this method. It would involve the installation of a Private Line Interface (PLI) to connect the newly installed TAS to the ARPANET IMP that is operational at Livermore. This TAS would be used to support remote terminals located in intelligence tanks at Sandia, Los Alamos, and Livermore. In addition there is the possibility that the TAS will become a NAS to permit the integration of a host processer at LLL (HP 3000). The PLI would perform the text encryption and decryption between COINS and the ARPANET, the GATEWAY, that was installed at NSA for the CINCPAC test, would perform the required internetwork protocol translations. This would provide LLL with 32 terminals capable of interactive or batch mode operations in the COINS II.

2.3.2.5.2 Naval Ocean System Center (NOSC)

(U) Naval Ocean System Center (NOSC) in San Diego is also intensely viewing the COINS II/ARPANET CINCPAC Test. They presently have a Private Line Interface installed and operational through the ARPANET to a parent organization. They have also indicated to the COINS PMO that a PDP-11/70 system is planned for installation. Although these equipments are intended for other usages, they could be utilized in a dual configuration, one of which would be a TAS accessing COINS II via the ARPANET/COINS II GATEWAY. Dual use of the PDP-11/70, the PLI and the IMP at NOSC would provide an additional 32 remote terminals capable of accessing COINS II.

2.3.2.6 NSH

(U) The Network Service Host (NSH) (a PDP 11/70) Computer currently houses four major applications of COINS, three of which are not active.

- Technology Transfer Research Facility (TTRF)
- Network Usage Information Subsystem (NUISS)
- User Support Information Subsystem (USISS)
- Network Monitoring Subsystem (NMSS)

During calendar year 1980, the COINS PMO is planning to move the TTRF subsystem from the NSH into a PDP 11/70 computer system of its own. Plans have been developed and negotiations are proceeding to relocate the TTRF facility into one of the community intelligence schools. The TTRF, as a separate facility, will be interfaced to the COINS II network and will add an additional 32 remote terminals to the existing population that is capable of accessing COINS in an interactive mode.

(U) During calendar years 1979-1980, the Network Usage Information subsystem will be transferred from the IBM 370 and RYE computers to the NSH. The NUISS maintains a centralized repository for management data by processing incoming update data; by retrieving information for managers in response to queries, and by providing special one-time analyses of data stored in its data base. It collects and integrates logging data from each of the COINS subsystems using a file transfer protocol for some hosts and tapes for the other hosts, and it provides tabulations on usage, operating performance, responsiveness and reliability. The data base is used to provide periodic quality control and gross performance/usage parameters to the COINS Project Management Office (PMO). This data is used for the day-to-day and long-term management of the network.

(U) Subsequent to the relocation of the TTRF, the COINS PMO has plans for developing a Network Monitoring Subsystem (NMSS). It is a replica of the ARPA Network Control Center Computer System. It monitors the entire Network, including communications circuits, in near real time, as observed and reported by the IMPs to the NMSS. The current NMSS is installed on a Honeywell 316 computer attached to an IMP at NSA. Like its NCC counterpart in the ARPANET, it receives performance data from all network IMPs on a timed periodic basis and prepares reports of communication network status that are printed on-line on the NMSS Teletype. Its program also receives diagnostic data from the network and produces reports on the NMSS Teletype. The NMSS proposed for the COINS PMO will expand to include information concerning Front-Ends, Gateways, Hosts and in some cases terminal usage. It will be developed on the NSH and will require the use of a File Transfer Protocol to forward the data for processing.

(U) The User Support Information Subsystem will also be developed for on-line access to reference the advisory material about COINS II and its procedures. The USISS data base and a set of mechanisms for accessing it will be used as a training vehicle for prospective users of COINS.

(U) The NSH with its three subsystems will expand its capability from 16 to 32 terminals that are capable of accessing COINS II in an interactive mode. The number of ports on the TAS and NSH are being increased to 48 by the end of FY 79 and will probably be increased to 64 by the end of FY 80.

2.3.2.7 IDHSC II/COINS II GATEWAY

(U) The physical connection between the COINS IMP at Arlington Hall station and the IDHS node will be completed during calendar year 1979. This will allow interaction in a batch mode using the process-to-process protocol from COINS I operations. During calendar year 1980, DIA and the COINS PMO plan to complete the logical connection. When completed, this software linkage will allow COINS-IDHS interaction through the Arlington Hall Station IMP. Communication between the two networks will allow both batch and interactive modes of operations.

(U) The DIA has estimated that the DODIIS will have a requirement for 500 terminals (MOD 37 or 1632 CRTs) to access COINS II. They further estimate that a capability for 50 concurrent connections into COINS II will be required.

2.3.2.8 Project BLACKER

(U) The COINS PMO has volunteered the network for conducting an NSA R&D experimental project called BLACKER. This project will investigate COMSEC techniques and equipment which will authenticate

terminal-to-terminal, host-to-host, or any combination thereof, and if authorized by access control mechanism, will establish a secure communications path for them to operate.

(U) The NSA SOLIS and the NPIC NDS are the two COINS II hosts that will be involved in this experiment. A BLACKER TAS with six terminals will be installed in the COINS PMO area. BLACKER Front-End Processors (FEPs) for SOLIS (WINDMILL host) and NDS will be installed in the respective host areas.

(U) The BLACKER experiment was originally scheduled for operation concurrently with the NDS and the WINDMILL (SOLIS/PROJECTOR) hosts' implementation. However, the project has been delayed and is not expected to complete the first phase of testing before the December 1980 time frame.

2.3.3 Calendar Year 1981

(U) The COINS PMO has considered several programs for implementation during this period. Among those are the PLATFORM/COINS II GATEWAY. These programs will expand the number of remote terminals capable of operating interactively with host systems in COINS II and are briefly discussed below. Figure 2-5 depicts the COINS network at the end of 1981. Table 2-8 provides a summary of the estimated interactive terminals requiring access to the COINS II network by source computer at the end of calendar year 1981. Table 2-9 provides a summary of the estimated interactive access requirements by interfacing networks. Table 2-10 provides the COINS II capability of accommodating concurrent interactive users.

2.3.3.1 ISC TAS

(U) The CIA Information Science Center (ISC), which is a classroom facility for training intelligence personnel, is considering alternatives developed by the COINS PMO for interfacing their

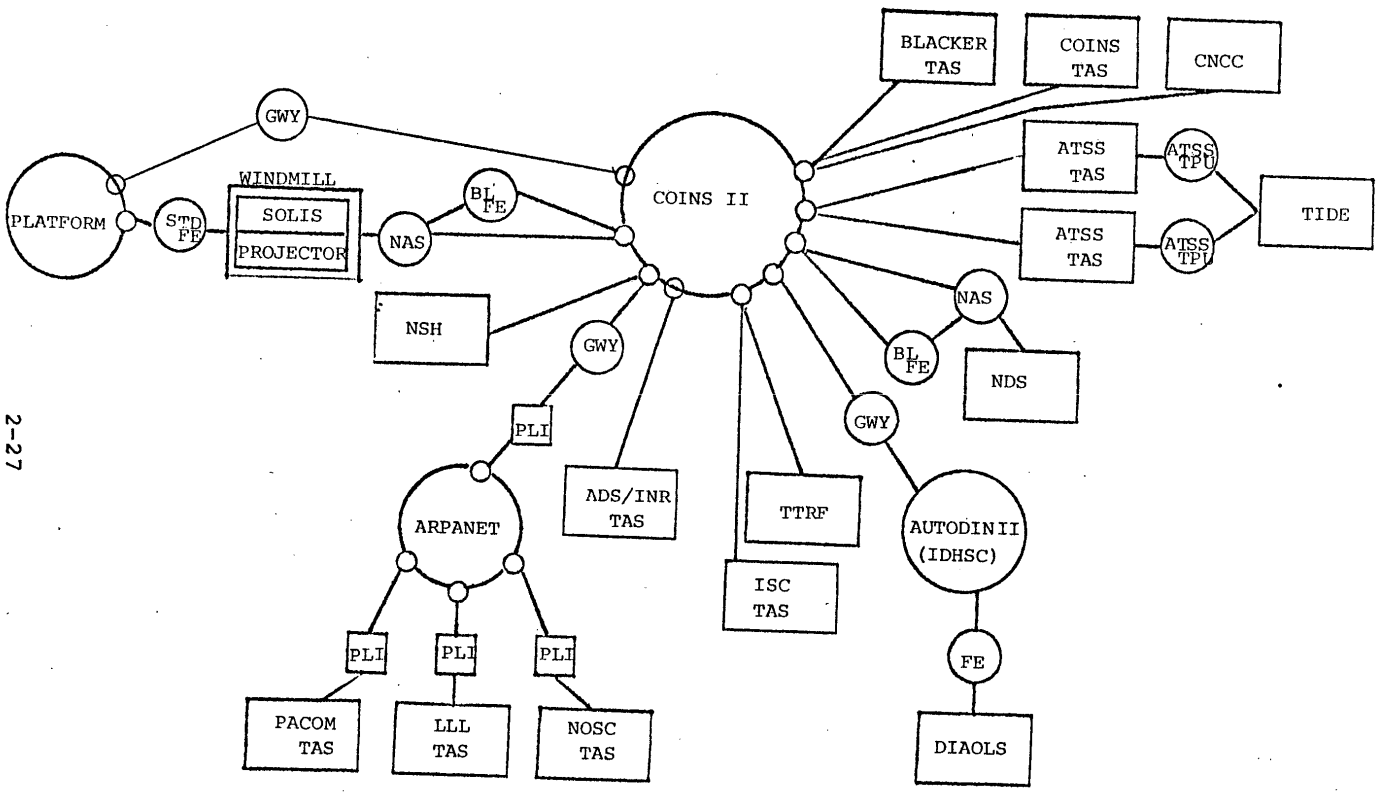

Figure 2-5. COINS Network Calendar Year 1981

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PDP 11/45 system into the COINS II network. This PDP 11/45 is currently their data processing system and will require modification. When reconfigured it would not be used solely as a COINS TAS but would be used in a dual capacity. The PDP 11/45 in the proposed configuration as a TAS will have a capability of 16 remote terminals accessing the network in an interactive mode.

2.3.3.2 ADS TAS

(U) The Intelligence and Research Division (INR) of the State Department has expressed a desire to significantly increase their access to COINS from 3 to 16 terminals. The method for achieving this increase would be through the installation of a COINS II Terminal Access System (TAS) at State in late FY-80 or in early FY-81 with 16 remote terminals on a PDP 11/45 provided by State in FY-80. Tentative plans for connecting this TAS to the COINS II network are to use the MBB IMP at State. A study concerning this connection is now being prepared for the COINS PMO in cooperation with the Department of State. The goal is that INR terminals on the TAS can access both COINS II and State Department's own Automated Document System (ADS) from a single terminal. It is anticipated that once this TAS becomes operational, then the three terminals in State/INR which are presently connected to the COINS PMO TAS would be dropped. This would make three more ports and terminals on the COINS PMO's TAS available for redeployment in FY 81.

(U) The Intelligence Community in the Washingotn D.C. area has expressed a desire to have the capability to access the State Cables in the Automated Document System (ADS) on-line via COINS II. As a result, the COINS PMO, in cooperation with the State Department has a study prepared on how to achieve this interconnection. This study was entitled "State Department's Automated Document System as a COINS II Host" and was dated August 3, 1976, but it

needs to be updated before any action along this line is initiated. However, before updating this study, the Department of State needs to resolve these issues:

- Policy issue as to whether or not State Department will permit the intelligence community in the Washington, D.C. area to have direct on-line access to ADS. (Note State Department is already providing many intelligence agencies in the Washington, D.C. area with copies of selected State cables each day.)
- Privacy issue as ADS contains information on U.S. citizens. (Note this may not be an issue as ADS has been registered by the State Department.)
- Security issue as ADS operates at the TS level and COINS II operates at TS SI/TK level.

2.3.3.3. PLATFORM/COINS II GATEWAY

(U) PLATFORM is an internal NSA packet switch network that utilizes ARPANET technology. Although the network was discretely interfaced in a server mode in 1979 to the WINDMILL host, the NSA DDT has expressed a desire to interface the COINS II network in a full user/server mode with adequate security features to protect the PLATFORM network. They stipulated a capability for 25 simultaneous interactive transactions. This interface, as in the case of the WINDMILL linkage, would be uni-directional (PLATFORM terminals accessing COINS II host only). This connection, when implemented, will add to the existing populations of terminals capable of accessing COINS II in an interactive mode.

2.3.4 Calendar Year 1982

(U) the COINS PMO has projected certain programs in the community that are candidates for accessing COINS II during this period. These programs if implemented will add to the terminal population of remote terminals capable of accessing COINS II in an interactive mode and are briefly discussed below. Figure 2-6 depicts the COINS network at the end of 1982. Table 2-11 provides a summary of the estimated interactive terminals requiring access to the COINS II network by source computer at the end of the 1982 calendar year. Table 2-12 provides a summary of the estimated interactive access requirements by interfacing networks. Table 2-13 illustrates COINS II capability of accommodating concurrent interactive users.

2.3.4.1 NMIC

(U) The National Military Intelligence Center (NMIC) has stated a requirement for their analysts to access the COINS II hosts. The COINS PMO in his projection has estimated an early calendar year 1983 for an operational capability. The interfacing of NMIC into COINS (uni-directional) will increase the terminal population capable of interactive transactions by 20.

2.3.4.2 SEAWATCH II

(U) The Naval Ocean Surveillance Information Center (NOSIC) has approached the COINS PMO on interfacing its SEAWATCH Host system into COINS II. There are 51 terminals associated with this host system that would access the network in an interactive mode. Plans for alternative methods of accessing the network are currently being developed.

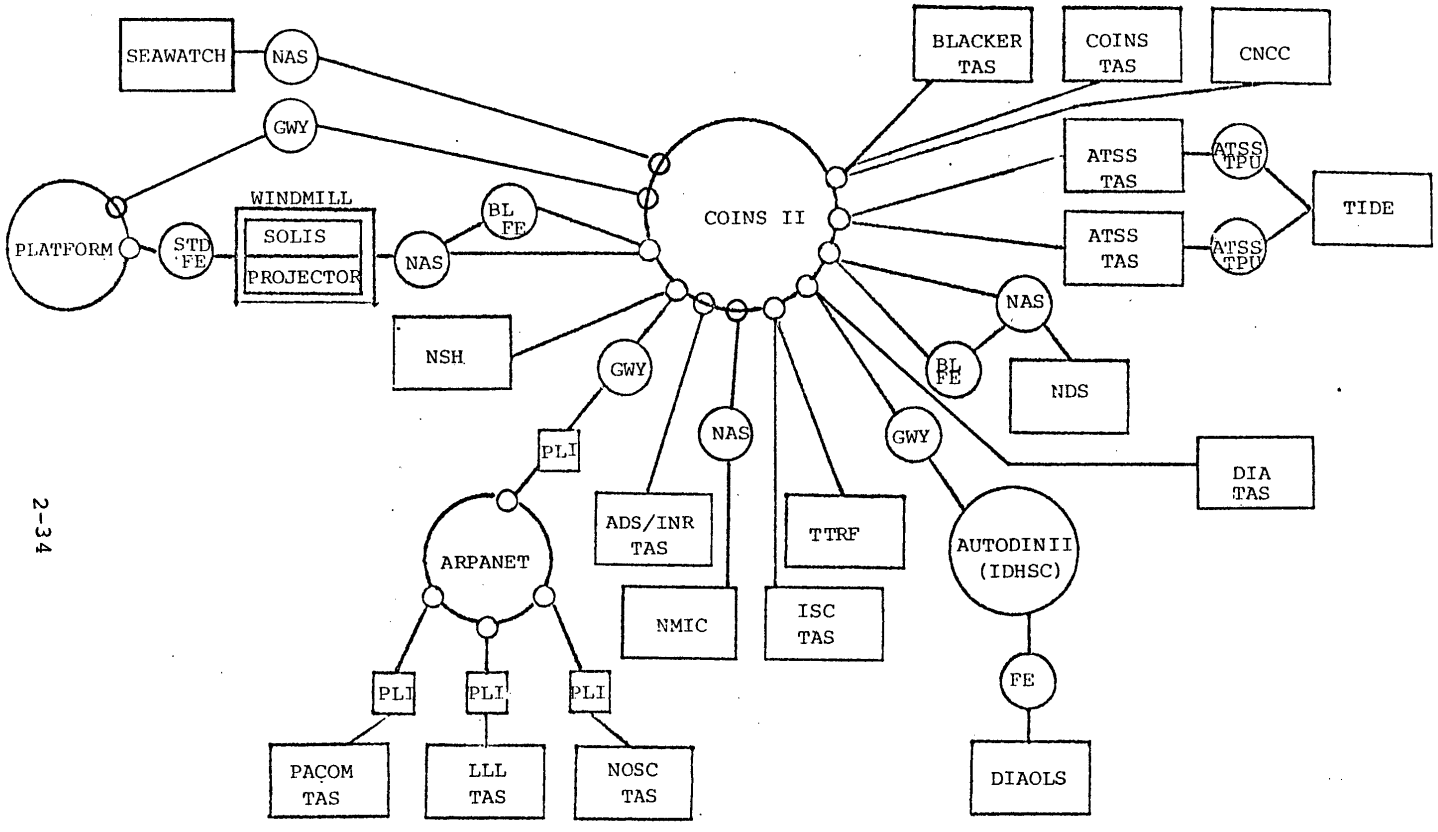

Figure 2-6. COINS Network Calendar Year 1982

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2.3.4.3 DODIIS

(U) The DIA has queried the COINS PMO on the possibility of installing a Terminal Access System (TAS) at Arlington Hall Station to access the COINS II network. Activation of this additional TAS would add 32 more terminals to the growing population of terminals capable of interactive transactions in the COINS II Network.

2.3.5 Calendar Year 1983

(U) Three other programs have been considered by the COINS PMO in his five-year projection. They are discussed below. Details on how these large programs will interface the COINS II network have not been developed at this time. However, when details are known, studies will be accomplished to obtain alternatives. Table 2-14 and 2-15 provide a summary of the estimated interactive terminals requiring access to the COINS II network by source computer and a summary of the estimated interactive access required by interfacing networks. Table 2-16 provides an estimate of the COINS II capability of accommodating concurrent interactive users. Figure 2-7 projects those host/terminals facilities in the COINS II network at the end of 1983.

2.3.5.1 IAIPS

(U) Naval Intelligence Command (NAVINTCOM) is developing a future program for an Integrated Automated Intelligence Processing System. In stating their requirements, they have indicated that they plan to utilize several of the COINS II software packages. In addition they desire a tie-in to the COINS II

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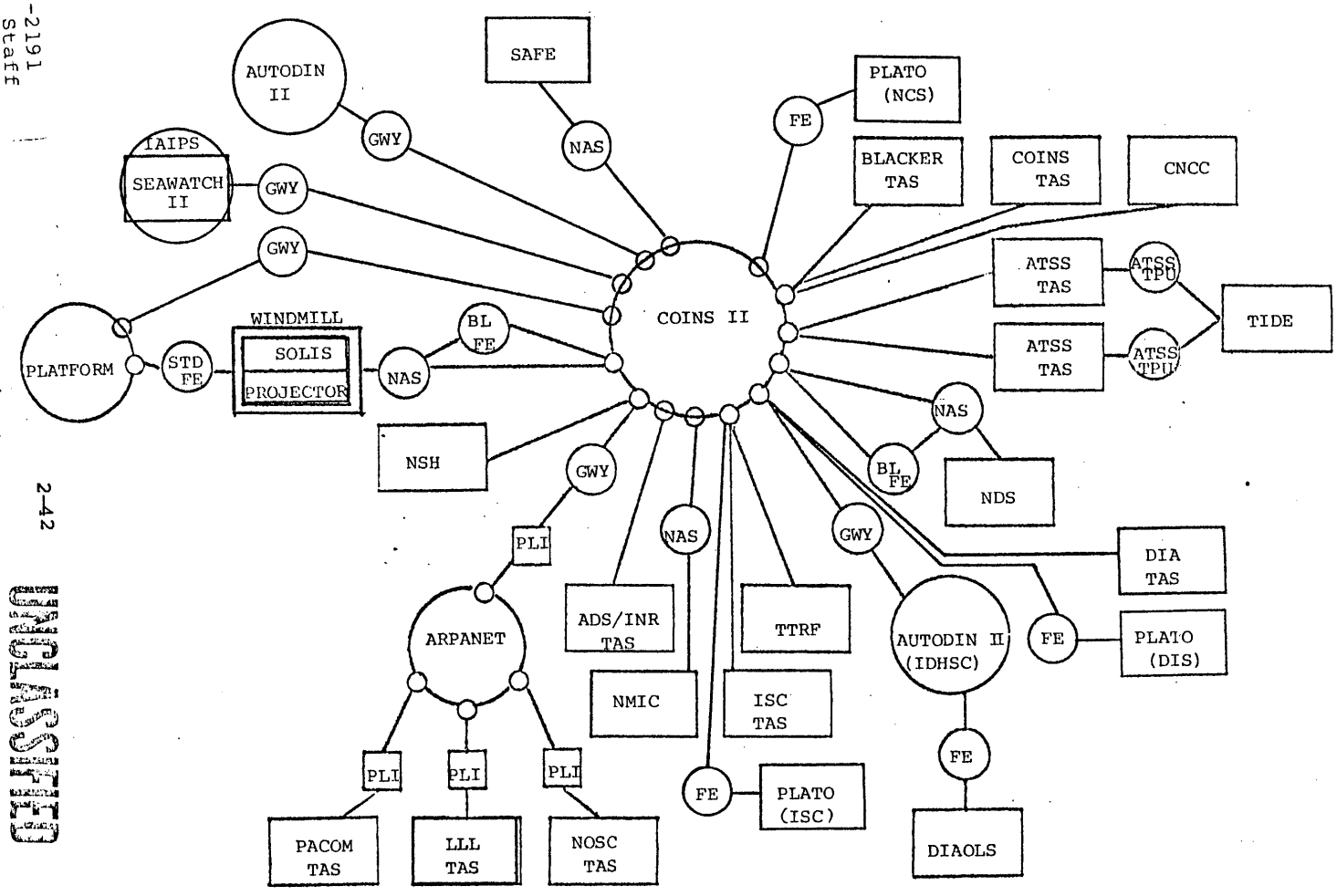


Figure 2-7. COINS Network Calendar Year 1983

Network. Since a detailed study on the alternatives for interfacing COINS II has not been accomplished, we can only project that IAIPS, when implemented will probably have a capability of 32 terminals accessing the COINS II network in an interactive mode.

2.3.5.2 SAFE Project

(U) The Support for the Analysts' File Environment (SAFE) project is a joint CIA and DIA program. The SAFE computer system(s) will be an information system(s) to support the needs of the production analysts and users in the CIA and DIA. It will be a dedicated on-line system that will provide:

- Faster distribution of incoming intelligence
- Improved mechanism for retrieval from central and personal electrical and hard copy files.
- Procedures for composing and coordinating intelligence information.
- Indirect access to other intelligence community and commercially available computer systems.
- Reduced paper usage, handling time and document storage space.

The SAFE system users (analysts) will be provided with a terminal position (a visual display unit with some form of print-out device) to accomplish their work.

(U) The November 3, 1978, SAFE Management Plan Revision indicates an initial operational capability for SAFE users in late 1982 with a full operational capability in 1985. The stated requirements indicated 1275 terminals for CIA with 600 concurrent users accessing the SAFE system. DIA and U&S Commands have indicated a requirement for 300 terminals at the initial operating capability and

1000 terminals at the full operating capability. The total system terminal population is expected to be 2275.

(U) In stating their requirement for accessing other intelligence community hosts, the DIA has listed COINS II as one of the networks they desire to interface. The number of concurrent users desiring access is unknown at this time. In contrast, CIA has not expressed a desire to interface external networks.

2.3.5.3 PLATO

(U) The Programmed Learning and Teaching Operations (PLATO) is being considered by the COINS PMO. The Foundation for Advanced Research (FAR) is under contract to do a cost benefit analysis along with a detailed study on what will be entailed in bringing a copy of PLATO system into COINS.

PLATO is a computer based instructional system developed at the University of Illinois. It displays individualized instructional materials on the terminal screen in the form of text, numbers, drawings and animated graphics and will allow students to interact with lessons through the terminal keyboard. The COINS PMO feels that a PLATO system in COINS could enable the schools and training facilities of the intelligence community to provide classified courses, share teaching resources and instructional materials.

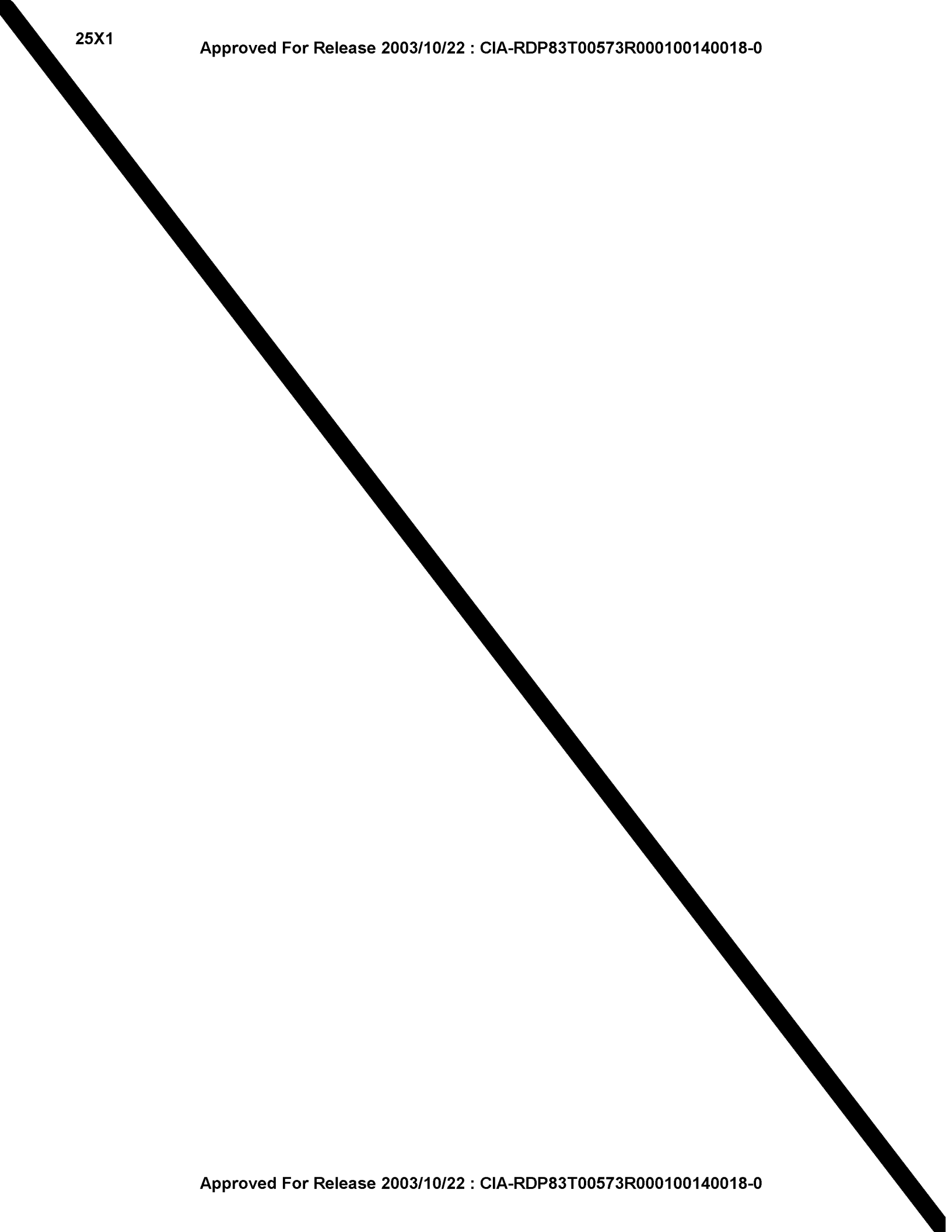
(U) The PLATO utilizes the Control Data Cyber 170, 70 or 6000 series computers. The input/output subsystems of these series computers supports a large number of plasma-panel graphic terminals that can be arranged in a classroom type cluster. PLATO query operations utilize AUTHOR language, whose capability is limited only by the author's ingenuity and experience.

(U) If studies indicate that it is economical to utilize a PLATO type system in the 1982 and beyond time frame, a large number of terminals from the system could be added to the COINS terminal population.

(U) For the purpose of the report, it is assumed that initially there will be one cluster of PLATO terminals in each of the three intelligence schools (ISC, DIS and NCS).

(U) The PLATO host processor will be connected to the network and should be capable of accommodating several hundred terminals simultaneously.

3.0 HOST SYSTEMS AND ASSOCIATED FRONT-ENDS



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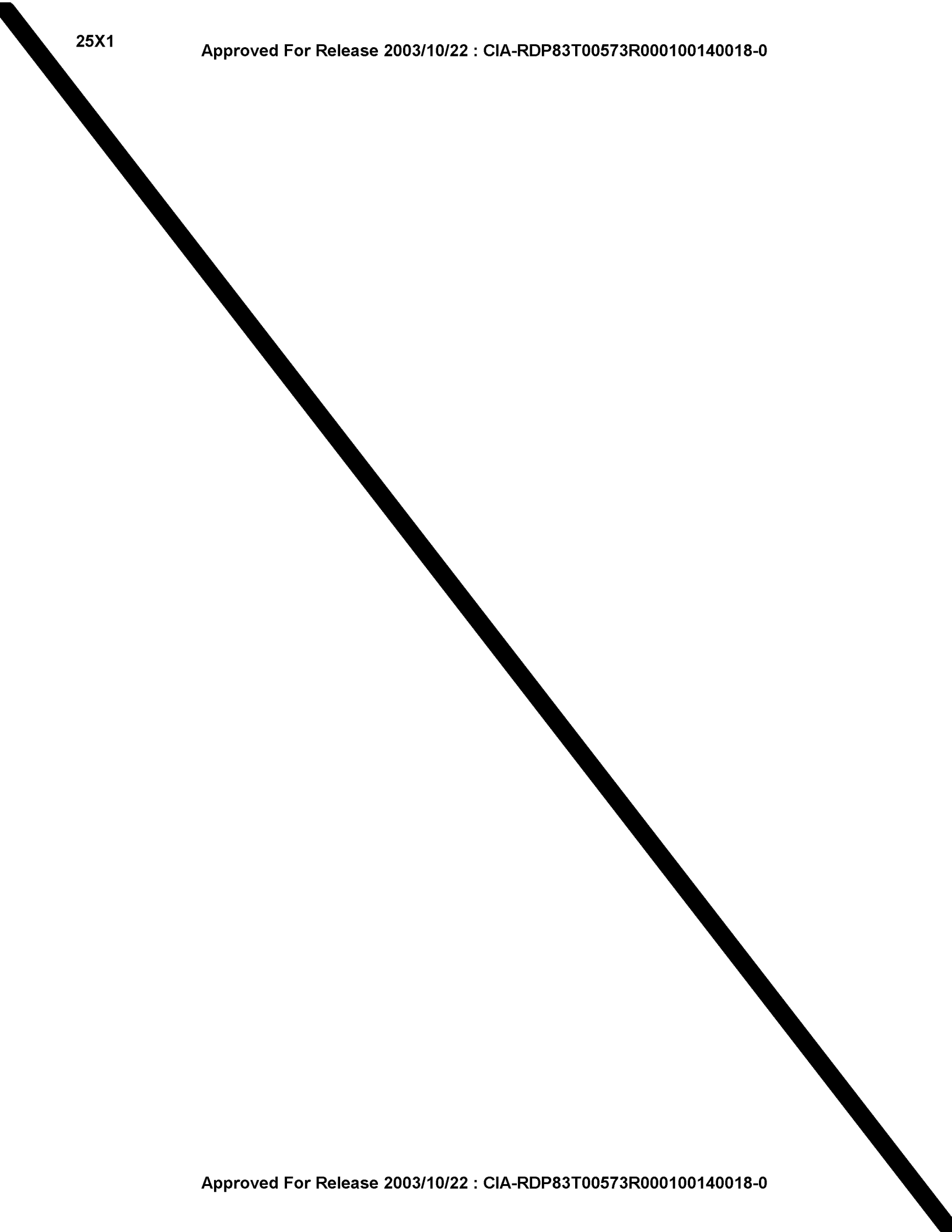
ware the FE is interfaced to the COINS II network Interface Message Processor (IMP), which is a Honeywell 316 computer. The effective data rate between the IMP and the FE is between 50 and 60 kilobaud.

(U) The current FE hardware contains only 32k of core storage but is otherwise a "standard" PLATFORM front-end including its software capabilities. However, the cut-down core memory size (from 64k) results in a limitation within the current SOLIS FE of supporting at most ten concurrent COINS II user terminals. Increase of core to the 64k regular size will, without software reprogramming requirements, provide for 30-40 concurrent terminal users within the FE (which is the capability of a standard PLATFORM FE).

(U) It should be noted that the SOLIS FE software is the ELF package which is modular in construction and consists of four major elements:

- Executive - controls all ELF processes
- NCP - network control program executing line protocols and initial connection protocols
- I/O - handling local I/O devices and terminal interface equipment
- Applications - the software interfacing between the FE and the SOLIS host

This ELF package is used also as the base for other COINS II front-ends (currently the INIs for RYE, see 3.2.3, and IIS, see 3.4.2). The primary differences in the front-ending software packages lie in the Application Module area which is by necessity host-dependent.



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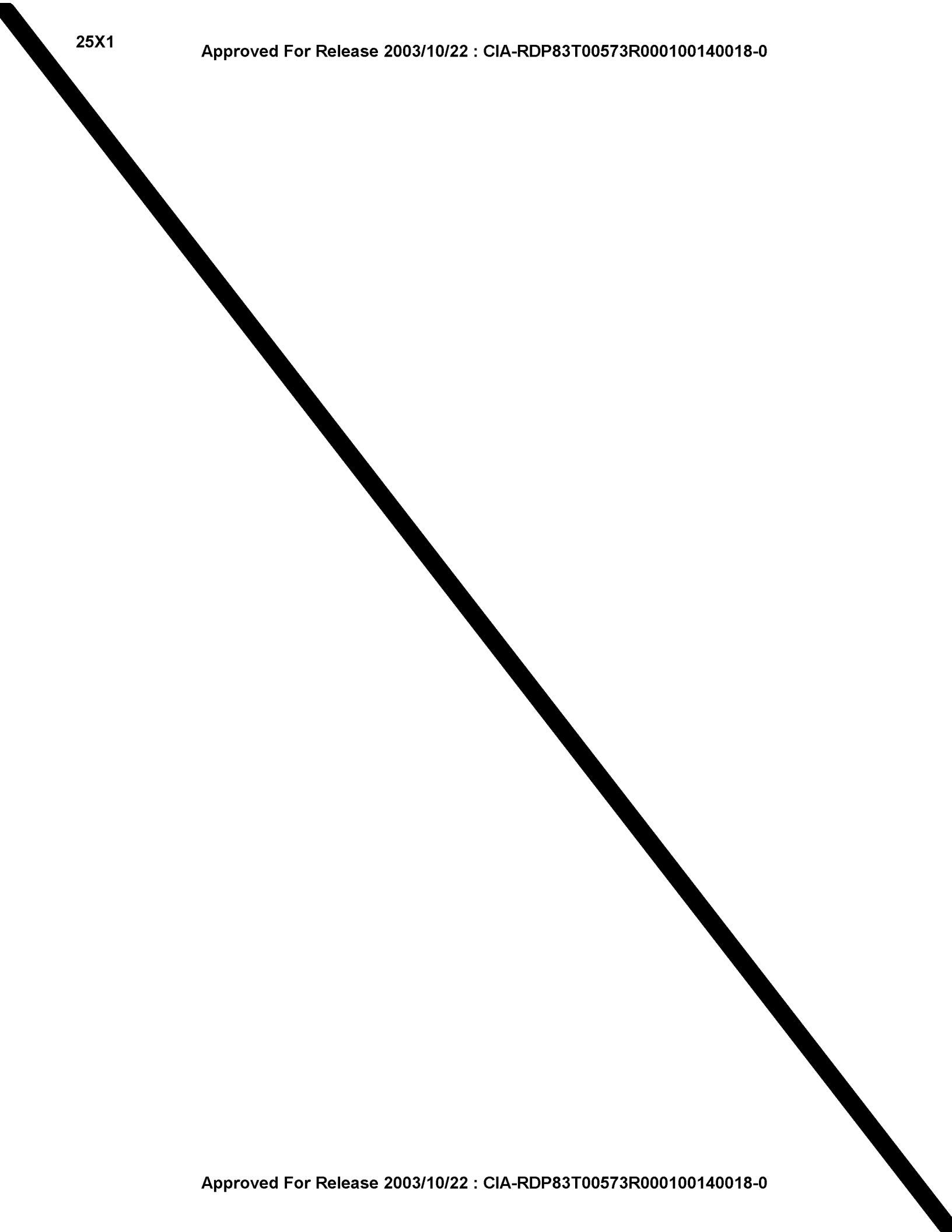
received" acknowledgment from the TAS to TIPS/RYE represents a logical acknowledgment for a batch of traffic received and thus provides a protocol highly superior to any other one which does not employ this procedure.

(U) Investigations have shown that the TIPS/RYE host has no room for future growth in data volume. Currently, it averages about 5758 transactions per month. On-line updates against the files per month are averaging about 43,618. There are approximately 2100 transactions going out to the COINS network. The balance of these transactions (3,658) are due to internal terminal queries. Thus, replacement of the present TIPS/RYE system with a more capable system is required.

(U) An additional problem exists currently in the limitation of TIPS/RYE in recognizing more than 15 different hosts, TASs, and GATEWAYS. This "address table" limitation is caused by the fact that each host, TAS, etc., requires two computer words for a complete identification, and the table containing these IDs consists of 30 words which are located in front of a file identifying all current communication activities between TIPS/RYE and other users. Consequently, the expansion of this table is not merely a matter of a parameter change, but would require actual program changes in the U-494. Due to resource limitations, NSA cannot expand the table. However, since the RYE system is going to be absorbed into the WINDMILL system (see 3.2.2 below), the software effort should be done only when it is recognized as mandatory due to a host number expansion of beyond 15 prior to the demise of TIPS/RYE.

Note that WINDMILL/PROJECTOR is not expected to have the above limitation.



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(U) Under project PROJECTOR there will be a phased interfacing of WINDMILL into the COINS II network. SOLIS, which is one of the two applications residing in the B7700 (WINDMILL) is currently interfaced to the network through the FE. It will probably remain intact for some time with the capability of handling 10 concurrent interactive transactions. In contrast, PROJECTOR will be phased in with a new separate front-end processor that will have the capability of handling 30 concurrent interactive transactions. When the Network Access System (NAS) becomes available (fourth quarter FY80), it will interface WINDMILL (both SOLIS and PROJECTOR applications) to the COINS II network. The NAS will have the capability of handling 32 concurrent transactions.

3.3 TIDE

3.3.1 The Host - General Remarks

(U) The TIDE HOST, basically a UNIVAC 494 system, supports the National SIGINT Operations Center (NSOC) and other elements in the USSS in carrying out their missions. The primary function of the TIDE system (and its upgrades) is to manage the inputs and outputs, and provide data processing and terminal support for a number of data collection and display systems that provide time sensitive information to users. Some of these systems are:

- ATSS - Analyst Terminal Support System
- OPSCOMMS - Operational Communications links to field locations
- CONTEXT - The Intelligence Community voice and Teleconferencing System
- IDDF - The NSA Internal Data Distribution Facility

- WARSAW - A graphic system driven by a DD 124 computer
- CARILLON - An IBM system for processing certain intelligence inputs
- OMNIBUS - A graphic system for replacement of WARSAW
- RYE - A NSA UNIVAC 494 host system
- RUSHER - A CDC 6600 system that processes intelligence data for input to a NSA data base
- And Other Systems

At the present time TIDE is able to access the COINS network (for batch access only) via an in house TIDE linkage. Plans are currently being implemented to establish the capability for ATSS terminals to enter both TIDE and COINS II as discussed below.

3.3.2 The ATSS Dual Connection

(U) The Analyst Terminal Support System currently in use is designated as ATSS-20. It consists of up to eight INCOTERM display devices called AUTOTERM terminals connected to a Terminal Processing Unit (TPU) with 32k bytes of memory, two dual floppy disks, and one shared printer. The TPU acts as a concentrator and is attached to the TIDE system via a 4800 baud communication line.

(U) The software for the AUTOTERM terminals is designed around multiple activity on the screen. Since NSOC deals with time sensitive information, ATSS AUTOTERM operations are conducted in a transactional mode with interrupt capability built into the system. Traffic destined for a specific AUTOTERM CRT must go to that terminal on a priority basis. The system also has an

interactive conference mode and can also receive transaction messages while operating in this mode.

(U) To provide additional support to the analysts utilizing AUTOTERM terminals, a plan has been developed to establish a connection between a TPU and the COINS II network while preserving the present TPU-TIDE communication link, thus permitting each AUTOTERM to access both, TIDE and all of the COINS II related resources. Implementation of this plan requires:

- Expansion of TPU memory of 64k bytes
- Replacement of one dual floppy disk by a rigid disk providing approximately ten times the data storage space with one-tenth of the floppy disk access time
- Software to be added in the TPU to interface it with the COINS II Terminal Access System (TAS) described in 4.1 below.

The resulting Analyst Terminal Support System will be known as ATSS-40.

(U) Figure 3.3-1 displays the planned connections of ATSS-40 system to the COINS II network via the TAS systems and to TIDE. Communication lines from the TPUs to both, TAS and TIDE, are to provide a 9600 baud capability.

(U) There are ongoing efforts to place 21 ATSS 40 systems, with appproximately 143 AUTOTERM terminals, into operations by the end of 1979. There are plans being formulated to at least double this number by 1980. These terminals and potentially more will be capable of entering COINS II, given only the TAS technology, by late 1983.

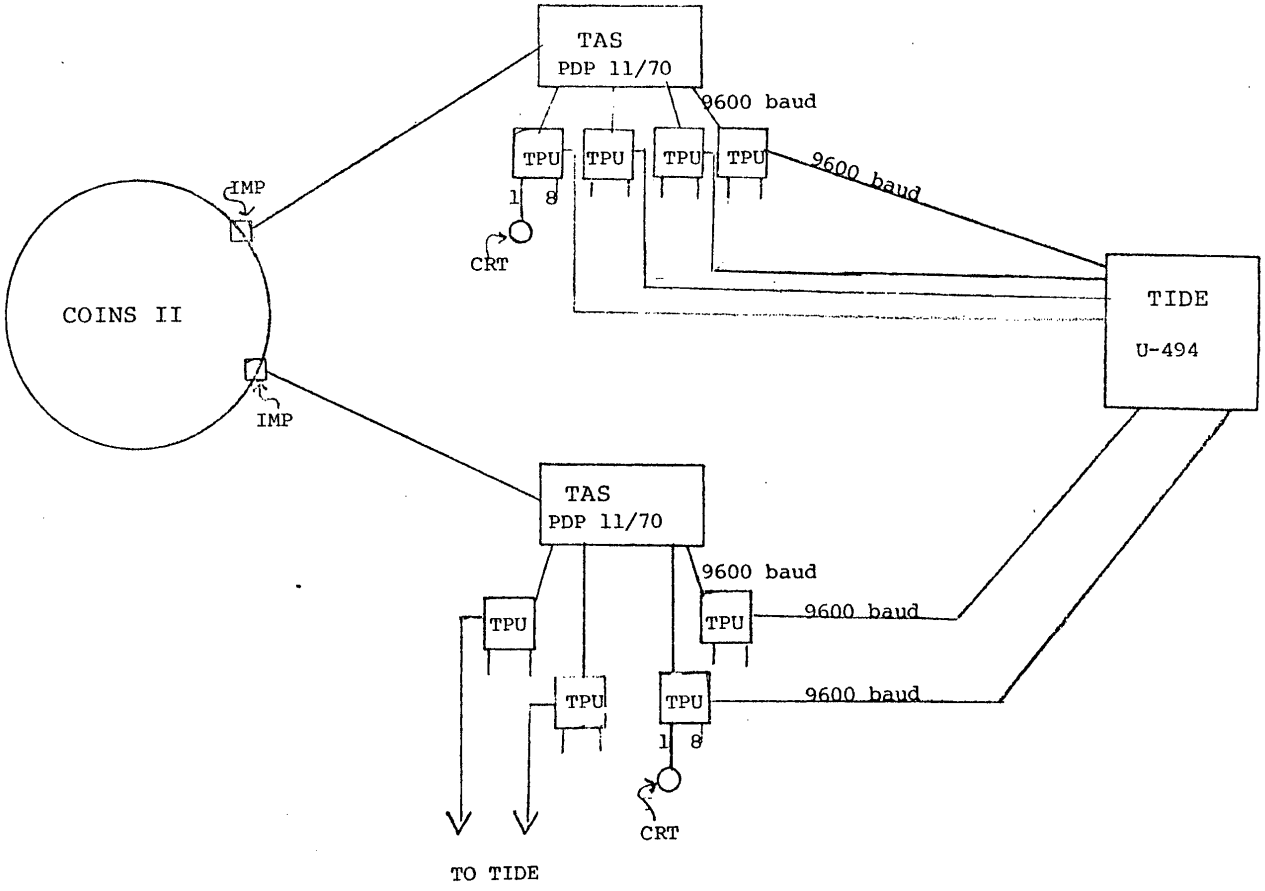

Figure 3.3-1. Analyst Terminal Support System Dual Connection

3.4 NPIC - IIS, NDS

3.4.1 Present Integrated Intelligence System (IIS)

(U) The NPIC IIS system is a multi-processing dual UNIVAX 494 system with 262k of 30-bit words of memory, 24 disk units, and three 1872 word-addressable drums. Communications are supported by 6 Communication Terminal Module Controllers (CTMC) each of which can handle up to 32 full duplex lines. Currently 185 terminal devices (of the 192 maximum) are installed. They are:

- The Sanders 804 Terminal. There are 67 of these terminals that interface in two modes (conversational and remote batch). They operate synchronously from 4800-9600 baud. All of these NPIC terminals are permitted to access the COINS (I and II) network.
- A variety of six different teletype devices that operate from 110-300 baud. There are approximately 100 of these teletype devices. All except two are allowed access to COINS.
- The DCT-2000 card reader/line printer device. There are eight of these devices operating at 2400 baud.
- Special Purpose Device. There are ten of these special purpose devices operating asychronously at 1200 baud. None of these are allowed access to COINS.

IIS is one of the COINS network batch host systems and is currently attached to COINS II via the INI (see 3.4.2 below) and to COINS I/IDHSC-I via the switch at DIA Arlington Hall.

(U) As discussed under 3.2.1 IIS also has the 15-host address limitation, which can be changed through software if required (such as "Doubling" the table length). However, the U-1100 NDS system will not have the same limitation. In fact, the NAS front-end will provide for host, TAS, GATEWAY identifications up to a limit of 256, i.e. it will be virtually unlimited.

3.4.2 The IIS Front-End, INI

(U) As discussed in section 3.1.2 the IIS front-end is a PDP 11/40 system based upon the ELF software which handles, through its Application Module, the batch protocol accessed to IIS as well as the IIS-user batch accesses to COINS II.

3.4.3 The New Data System - NDS

(U) The new NPIC Data System (NDS) utilizes the UNIVAC 1100/44 system. Figure 3.4-1 illustrates the NDS configuration of importance to this study. The NDS has four processors or Command/Arithmetic Units (CAUs) and a primary storage capacity of 262k (36 bit words). Plans exist to increase this storage capacity to 512k words in 1979. There are eight cabinets of extended memory totalling 1024k (36 bit words) with an 850 nanosecond response time. The disk subsystem currently consists of 8 disk packs and 6 drums to be expanded to 24 disk packs in the future. There are two input/output access units (IOAUs) each of which can accomodate 24 I/O channels. To relieve the CAU's of most of the processing functions associated with the control of data communications, the NDS has four Communication Symbiont Processors (C/SP). Each C/SP has the capability of handling 64 full duplex channels or 128 half-duplex channels.

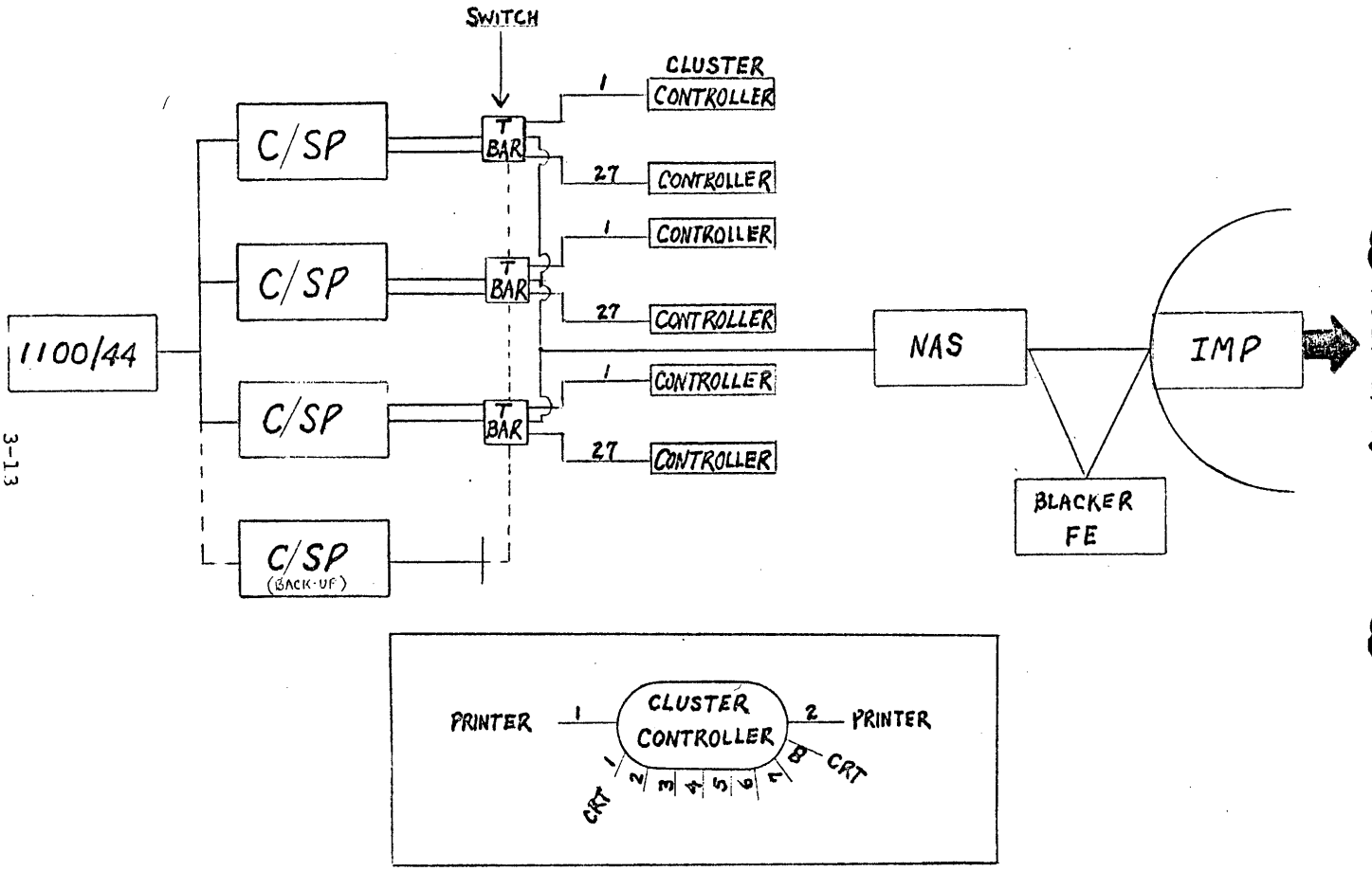

Figure 3.4-1. NPIC Data System

(U) This 1100/44 system will have a rather large terminal population. There are 476 Delta Data CRTs, four 9200/9300 (UNIVAC CARD READER/Printer). It is anticipated that each of the 476 Delta Data terminals will be able to access COINS.

(U) The large number of CRTs are operated asynchronously through 81 cluster controllers. Each cluster controller has the capability of controlling 8 CRTs and 2 printers. The controllers also interface with the C/SP in a synchronous bit serial mode through a T-Bar switching arrangement. The cluster controller uses a high speed buffer with 256 character storage capability to compensate for the signal conversion from asychronous to synchronous bit serial mode. NPIC has divided the NDS into two subsystems: (1) the production subsystem, which utilizes 3 CAUs, the primary memory and one-half of the extended memory; and (2) the development subsystem which utilizes the other CAU and half of the extended memory.

(U) NDS is designed to support three modes of operation:

- Batch Processing - accept a query, activate a query processing task, deliver the response from a queue on a no-limiting-response-time requirements basis. Similar to COINS I procedures.
- Transaction Processing - access is achieved via CRT displays to terminal. The displays are heavily light pen oriented (i.e. menu type).
- Demand Processing - a line-by-line operation whereby each input at a terminal results in a corresponding NDS output-could be a continuous process.

(U) The milestones for the development of NDS are as follows:

- 1100/44 COINS software development starts January 1979.
- Software development for a new COINS front-end, the Network Access System (NAS), by September 1979.
- NAS Software installation by October 1979.
- NAS network testing by January 1, 1980.
- NAS Integration testing by May 1980.
- Full integration of NDS (with NAS) achieved May 1980.

For the 1st six months of operations, the NDS will only support batch mode (COINS I protocol) for accessing by COINS users.

3.4.4 The Network Access System - NAS

(U) For a discussion thereof refer to section 4.1.2.

3.5 DIAOLS, DISP

3.5.1 The DIA On-Line System - DIAOLS

(U) DIAOLS is a host computer system at Arlington Hall Station, utilizing dual H-635s, which supports the users of the Department of Defense Intelligence Information System (DODIIS). Of the two processing systems, System II provides programming services and remote batch service, while System I provides interactive data management capability. COINS users utilize System I exclusively.

(U) At the present time DIAOLS (System I) will support a maximum of 36 concurrent users. The software algorithm employed by System I DIAOLS provides priority access to "in-house DIA" users such that up to 33 in-house connections are honored. Consequently, a guaranteed minimum of 3 COINS users are being accomodated concurrently. It DIA users drop off, then an additonal COINS connection will be honored for each DIA user below the 33 limit.

(U) COINS queries are queued upon receipt by DIAOLS and subsequently executed in a time sharing mode.

3.5.2 DISP

(U) The improvement for the present DIA system designated as DIAOLS Improved Service Program (DISP) will exchange the present H-635s for Honeywell 60/level 66 computers. Each CPU will be associated with an I/O Multiplexer which is tied into a separate DATANET 6678 front-end that can service up to 96 lines. Systems I and II will be preserved under DISP and will both be connected to a Dynamic Terminal Switch (DTS) which is designed to handle 200 CRTs and 25 RBTs. In addition, another DISP objective is to double the number of concurrent users capable of being services to 72. However, it must be noted that the present priority algorithm for concurrent access is not going to be changed, i.e., under DISP COINS II users are guaranteed a minimum of six connections, with an additional concurrent connection for each one of the 66 available "DIA" connections.

3.5.3 IDHSC

(U) The Intelligence Data Handling System Communications (IDHSC) network is the telecommunications subsystem of the DOD Intelligence Information System (DODIIS). It proivdes the means for collectors, producers, and consumers of intelligence to access remote data bases through computer-to-computer and interactive

terminal communications. The IDHSC network operates at the Special Activities Office system high-security level, and is in two evolutionary versions, IDHSC I and IDHSC II. Both versions essentially consist of mutually exclusive software which run on PDP-11 communications processors located at each network site. IDHSC I presently supports query/responses (batch) and limited bulk data exchange of information between four DODIIS users and the national level intelligence files resident on the DIA System (DIAOLS), and interfaces these users to the Community On-line System (COINS) host systems at the National Security Agency and the National Photographic Interpretation Center. IDHSC II improves upon IDHSC I, allowing both interactive and batch communications, remote update and retrieval of files, and packet switching technology in a distributed network design, IDHSC II will add substantially more DODIIS sites to the network and will continue to interface with COINS.

(U) The objective of IDHSC is to provide for a standard data communications network supporting the intelligence analysts requirements for remote intelligence data access; to provide for the integration of intelligence information systems and the reduction of dedicated circuitry; to preclude parallel independent software developments; and to provide for a single standard DODIIS Defense Communications System Automatic Digital Network (AUTODIN II) interface.

3.6 SEAWATCH II

3.6.1 The HOST - General Remarks

(U) The SEAWATCH II system supports the Naval Ocean Surveillance Information Center (NOSIC) in its processing, analysis, storage and dissemination of intelligence information. The host is a dual Control Data Corporation (CDC) 6400 computer system (one CDC 6400

is utilized as a hot standby) with 512k words of extended core memory. Currently, there are forty-three (43) 211-57 CRT terminals connected to five 216 concentrators, each 216 concentrator being physically interfaced to a 2400 baud port of a 6671 multiplexer. The 6671 multiplexer is physically interfaced to an I/O port of the CDC 6400.

(U) Closely related with the SEAWATCH system is a Navy Automatic Relay Center (NARC) and its CDC System 17 Communications Processor. System 17 is physically interfaced to the AUTODIN I ASCs at Andrews Air Force Base and Fort Detrick, Maryland, via 1200 baud circuits. It is also interfaced to a WANG 2200 processor which composes messages from the reports prepared by 21 WANG terminals. These messages are transmitted out to various intelligence organizations via the AUTODIN I System.

(U) The NARC is also interfaced to the SEAWATCH host through the NOSIC Communications Center's 1718 AUTODIN processor and a 6682 data channel converter. Message queries from intelligence users are forwarded to NOSIC via the AUTODIN I network. They are received and queued in the host computer and latter acted upon by analysts at the 211-57 CRT terminals. These analysts query the files in the SEAWATCH host; screen the responses; and later forward these responses to the users via the AUTODIN I network.

(U) NOSIC has recently installed eight colorgraphic dual screen terminals which are connected to ports on a PDP-11/70 computer system. The PDP-11/70, acting as a concentrator, is physically and logically interfaced to the CDC 6400 through a direct channel coupler (DEC-DRHCD). The PDP-11/70 is also interfaced to the CDC 6400 via the 6671 multiplexer. In this case it emulates a 216 concentrator with 211-57 CRT terminals attached to it.

(U) The COINS PMO and NOSIC representatives are currently developing plans for interfacing the SEAWATCH host into COINS II. The proposed interface to COINS II will essentially be access only (uni-directional, SEAWATCH to COINS II).

(U) Attachment to the COINS II network will first involve the installation of a TETRAHEDRON communications node in the machine room at NOSIC. The COINS II IMP can then be installed and dual connected to two other COINS II IMPs.

3.6.2 Proposed Front-End (FE)

(U) The Network Access System (NAS), discussed in section 4.1.2, has been proposed as the FE for SEAWATCH. It would provide the physical interface that matches the line and signal characteristics of the NAS I/O system to the line and signal characteristics of the host I/O system. Logically, it would provide an interface between the NAS and the host software systems. The NAS would also provide a physical and logical interface to the IMP.

3.7 NMIC

3.7.1 General Remarks

(U) The National Military Intelligence Center (NMIC) has a system that provides automated data handling and communications support to the DIA Current Intelligence and Warning effort. It has the capability to store and retrieve output information and generate intelligence reports. The current NMIC host consists of seven PDP-11/70 configurated into five systems as follows:

- Message Support System(MSS)
  There are two PDP-11/70 devices associated

with the MSS. One PDP 11/70 receives input messages from GENSER and DSSCS and contains a five day file of traffic. The other PDP 11/70 contains profiles and reports and disseminates information to analysts' positions through teletype printer devices.

- Network Control System (NCS)
  The NCS has one PDP 11/70 that controls the internal data flow and the Indication and Warning Communications network circuits.

- User Support System (USS)
  There are two PDP 11/70 devices associated with the USS. They provide CRT terminal support, user interface and a working storage data base for analysts. There are currently (20) twenty U-1652 CRT terminals tied to the USS through a BR-1569 multiplexer.

- Collection Coordination Facility (CCF)
  One PDP 11/70 device will eventually provide responses to time-sensitive intelligence requests.

- Intelligence Support Interface Processor (ISIP)
  One PDP 11/70 performs the function of interfacing NMIC to external automated systems. Currently, NMIC is interfaced to the DIA on-line system. In October of 1979 the ISIP will be interfaced to AIRES.

The COINS PMO is currently developing plans to interface the NMIC host with COINS II. The proposed interface with COINS II will be via the ISIP and allow access only (NMIC accessing COINS II hosts).

3.7.2 Proposed Front-End (FE)

(U) The COINS PMO has proposed the Network Access System (NAS) (discussed in section 4.1.2) as the FE for NMIC. Since the ISIP performs the functions of interfacing NMIC with external systems, two alternatives have been proposed for the NMIC host interface with the NAS. The first alternative would interface the NAS to the ISIP through a teletype I/O port of a BR 1569 multiplexer. NMIC terminals accessing COINS II host would operate in a line-by-line mode as opposed to a screen mode. The second alternative would interface the NAS to the ISIP by direct coupling through a Network Link Microprocessor Module (DMC-11).

(U) Attachment of the NAS to the COINS II network could be accomplished through the use of extant communications. If the NAS is installed in the AIRES computer center it could be connected via a 50 kbit circuit to the DIA communications center at Arlington Hall and attached to a COINS II IMP. An error correction unit (ECU) would be needed at both ends. In addition a local host/distant host (LH/DH) module would be required with the NAS to provide the hardware interface logic for attachment to the COINS II IMP. A local host interface circuit card (HIC) would be required at the DIA Arlington Hall IMP.

3.8 NSH

3.8.1 Host System

(U) Since its conception, the Network Service Host (NSH) has housed four major COINS applications, namely:

- Terminal Access System
- Technology Transfer Research Facility (TTRF)

- COINS Network Management System (CNMS)
- User Support Information Subsystem (USISS).

With these applications the NSH functions as a TAS and also in a limited capacity as a research facility for evaluating information handling tools, a source of network performance data, and a library of reference information for network users.

(U) The NSH utilizes a PDP-11/70 computer system that is located in the COINS PMO area and interfaced with COINS II as a host computer. The UNIX operating system is the basic software working in conjunction with a Terminal Access System.

3.8.1.1 TTRF

(U) The TTRF, as a subsystem of the NSH, is currently being used to evaluate the following:

- ADAPT I - Uniform Data Language - UDL is a common COINS retrieval language which is transformed to appropriate target query languages supported by the other network hosts.
- NED - A cursor-oriented text editor (RAND editor) which is to be tested as a standard for the COINS Network.
- PLOT 10 - A graphics package that could become a standard for COINS.
- RITA - An interactive transaction agent produced by RAND.
- RAND EDITOR

(U) The COINS PMO has developed plans to relocate the TTRF subsystem at the NSH to a separate PDP-11/70 system located at one of the intelligence schools. Negotiations are proceeding and accomplishment of this task is expected during calendar year 1980. As a new separate host in the COINS network, the TTRF resources can then be utilized exclusively for:

- Developing and demonstrating pilot applications
- Training of the potential community users
- Conducting operational testing with potential users
- Assessing the application jointly with the trial users
- Providing recommendations for disposition, i.e. installation in the system or remove from the system

Until the new host at the selected intelligence school is ready for TTFR operations, the current NSH must retain those applications being evaluated (i.e. RAND EDITOR, ADAPT, RITA and PLOT 10).

3.8.1.2 CNMS

(U) The COINS Network Management System (CNMS) provides the data needed by the local and network managers to perform the day-to-day management of the network, and maintain a base of performance and usage data for use in detecting trends and for long range planning. The following subsystems support the CNMS:

- The Network Usage Information Subsystem (NUISS)
- The Network Monitoring Subsystem (NMSS)

3.8.1.2.1 NUISS

(U) The Network Usage Information Subsystem (NUISS) has been operating for the last five years and provides network usage and performance data to the COINS community. It uses system and switch data recorded on magnetic tapes by the COINS hosts and the DIA switch. The data is processed and summarized on the IBM 370 and then used to update on-line files that are accessible on the NSE RYE system.

3.8.1.2.2. PILOT NUISS

(U) During calendar year 1979-1980, the PILOT NUISS system will be installed on the NSH and integrated into COINS II. When fully implemented through the rewriting of the software to process the incoming data and to produce pre-formatted reports, the NUISS data will be available to the COINS community. The NUISS will be further integrated into COINS II through the use of the File Transfer Protocol to send system logging data from hosts. If the current trend of installing UNIX-based hosts continues (i.e. TASs, NASs, and GATEWAYS) the File Transfer Protocol will not be required. The TAS already contains TAS Data Transfer Process (TDTP), which efficiently handles all File Transfers for the NUISS, the TAS, File System downloading and etc. The PILOT NUISS will be upgraded as required to accommodate new participants in the COINS network.

3.8.1.2.3 NMSS

(U) During calendar year 1980, the PMO will develop the Network Monitoring Subsystem (NMSS) on the NSH. It will process status and throughput data that is collected by the NCC computer and

transferred to the NMSS. It will also request and process certain status and throughput data (collected by the master TAS and eventually, the NAS) and integrate it with the NCC data. Management reports will be accessible by the community.

3.8.1.3

(U) The User Support Information Subsystem (USISS), as it exists today, requires extensive labor actions to inform and train the users of the COINS network. Subsequent to the relocation of the TTRF subsystem in calendar year 1980, the COINS PMO plans to develop an on-line USISS. Essentially it will be a central repository of information about COINS II (a data base) and a set of mechanism for accessing it. The information that will be contained in this data base is as follows:

- Users of COINS
- Files that can be accessed from COINS II terminals
- How the files are structured
- Methods used to obtain access to COINS
- Methods used to obtain access to the various files of COINS Host Computers

(U) USISS will be used as the training vehicle for prospective users of the COINS II network. Reference and advisory material about COINS and its procedures will be available through on-line access in either batch or interactive mode depending upon the capability of the host to which user terminal is attached.

(U) The NSH with the USISS and CNMS will be expanded to a 32 terminal capability for interactive transactions into the COINS network.

4.0 OTHER NETWORK INTERFACES

4.0 OTHER NETWORK INTERFACES

(U) In addition to the host systems discussed in Chapter 3 above, there are three special host systems, one security-dedicated (experimental) system, and five network-to-network gateways all of which interface with IMP's (network modes) of COINS II directly. They are:

- Terminal Access System (TAS)
  Network Control Center (NCC)
  Technology Transfer Research Facility (TTRF)
- BLACKER
- Gateways to ARPANET
  ISHSC-II
  PLATFORM
  AUTODIN II
  IAIPS
- Network Virtual Terminal (NVT)

The following sections present a discussion of the functions, status, and traffic handling capabilities of these devices.

4.1 TAS, NAS

4.1.1 The Present TAS

(U) The Terminal Access System (TAS) of the COINS II network has been designed for the specific purpose of enabling terminals not associated with a host system to gain access to the network. At the present time there is one TAS in operation to which are attached 16 Teletype Model 40 terminals each equipped with its own printer.

(U) The TAS hardware is a PDP 11/70 with 192K 16-bit words, magnetic tape, disks, and a line printer. Communication with the terminals is over 9600 baud lines asynchronously.

(U) The TAS software is the UNIX operating system, an interactive, time-sharing system which supervises and schedules the execution of all processes within the PDP 11/70. Embedded in the system is the Network Control Program (NCP) which corresponds to the NCP in the SOLIS front-end (see Section 3.1.2) and is also used in the ARPANET.

(U) Some noticable characteristics of the TAS software are itemized below:

- A minimum of four system buffers of 512 characters each are used for all data activities with peripherals and communication lines. Each system buffer is divided into eight 64-character buffers, which are dynamically assigned for data as needed and released when no longer required.

- A protection against core buffer overload is built in such that data buffers are emptied into disk when TAS realized the high-load condition.

- When dealing with TIPS/RYE in a batch mode and receiving traffic of up to 350 segments of 150-characters, each TAS places all segments onto disk and operates together with TIPS/RYE in a positive acknowledgement manner, i.e., TAS generates a message to TIPS/RYE acknowledging receipt of each segment.

- Where dealing with large (1000-character) blocks from SOLIS destined for a specific TAS terminal's printer, the large block is kept in core buffers of TAS until printed, which takes 5-6 seconds after printing initiation because the printer speed is slower than the 2400-baud line. Thus, core memory is occupied throughout this time. Note that no logical (message) acknowledgement is issued from TAS to SOLIS, since SOLIS is not capable of handling this protocol. Instead SOLIS sends the next print buffer after ten seconds which was determined to be a "safe" time period.

- In accordance with the asynchronous communications protocol, traffic from a terminal is placed into a series of 64-character buffers and appropriate control information is queued up in a stack. As the software works down to this queued-up information in the stack, programs are activated to process the data. At that time and not earlier, errors can be detected which were due to communication problems over the 9600 baud asynchronous connection. Under relatively "busy" conditions of TAS, it is quite possible that the delay in error detecting could slow down or clog up the system.

(U) Tentative plans have been formulated to increase the number of terminals connected to the TAS up to a maximum of 64. ICA has been informed that the UNIX software has been written to support this number of terminal connections; however, the question must be raised as to whether or not a study has been made as to the degree of system performance degradation that results as the number

of simultaneous users increases. In any interactive system, as the number of simultaneous users increases, the response time steadily and sharply degrades. Arbitrarily making an unmodified system available to more and more users may be self-defeating, since the response time gets higher an increasing number of users will be come dissatisfied and stop using the system.

(U) In complex networks such as COINS II, where there are possibly multiple network components between the user's terminal and the host one is trying to access, the overhead at each succeeding intervening component between the user and the destination host has a commutative effect on the total system's performance. Moreover, studies conducted at IBM's Yorktown, N.Y. Watson Research Center have shown that each second of system response time degradation leads to a similar degradation added to the user's time for entering the following request, because of the effect the increased waiting time has on an individual's attention span. This amounts to even more overhead being generated. No hardware or software changes should be made at any point in the network without an analytical study being made - based on the network's engineering description - to determine what effect the change will have on the performance of the network.

4.1.2 The Network Access System - NAS

(U) An activity is underway to develop a standard Network Access System (NAS) from the currently existing TAS, will have the following capabilities:

- Be a terminal concentrator for access to the COINS II network (i.e., be a TAS).

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and provides short typed messages when it senses IMP status changes. The statistical messages are compiled by the NCC and result in periodic summary information.

(U) Plans exist to augment the NCC capability by developing an additional Network Management System (NMS) for COINS. The NMS would receive NCC data on performance, plus usage data from COINS hosts/FEs and perform the data reduction. This would highlight COINS related malfunctions and provide a base for trend studies of faults.

4.4 TTRF

(U) The Technology Transfer Research Facility (TTRF) which currently resides as a subsystem on the Network Service Host (See 3.8.1.1 above) will be relocated into a computer system of its own during 1980. Its purpose is to function as a test bed for the development and evaluation of new hardware and software tools of interest to the community. TTRF will also be able to serve as a backup to the TAS, since it will be implemented in a PDP 11/70 with a UNIX-based operating system.

(U) The software capabilities will be augmented to include the ARPANET TELENET protocol and a file transfer protocol, the latter one being designed for efficient data transfers of large volumes. When implemented the file transfer protocol will make possible the transfer of usage and performance data between host FEs, TASs, the NSH, TTRF and the NCC.

4.5 GATEWAYS

(U) Several agencies of the Intelligence Community have separate digital information systems and have expressed their desires to interface with COINS II. The intelligence information systems of these agencies either function as hosts in another network or

exist with requirements to utilize one of the DOD common usage networks. In order to provide these agencies with the capability for interoperability, the COINS PMO is considering the use of GATEWAYS.

(U) The GATEWAY will basically function in two ways. Firstly, it will perform the actual internetwork communications. These include the establishment of connections, handling of data, and breaking of connections. Secondly, it will be the manager. This involves controlling and monitoring of GATEWAY operations, and the maintenance of the GATEWAY software and hardware. There are currently five GATEWAYS being planned for COINS II. Table 4-1 provides a summary of those GATEWAYS.

(U) GATEWAYS represent the technical solution to a problem that has its foundations in management, and at best they should be considered only temporary measures for effecting inter-network operations. The basic problem is a lack of interoperability guidelines for network engineering, and the associated common intelligence community authority to decide on and enforce these guidelines. As a result a network NODE is created - GATEWAY - which results in the generation of considerable network overhead because of all the translations/conversions that must be done to effect inter-network communications. While GATEWAYS are a necessary stop-gap measure, plans should be formulated to effect changes in all of the indigenous networks in the intelligence community; if not to allow the complete phase-out of the GATEWAY, at least to considerably reduce the conversions they must perform with attendant network overhead.

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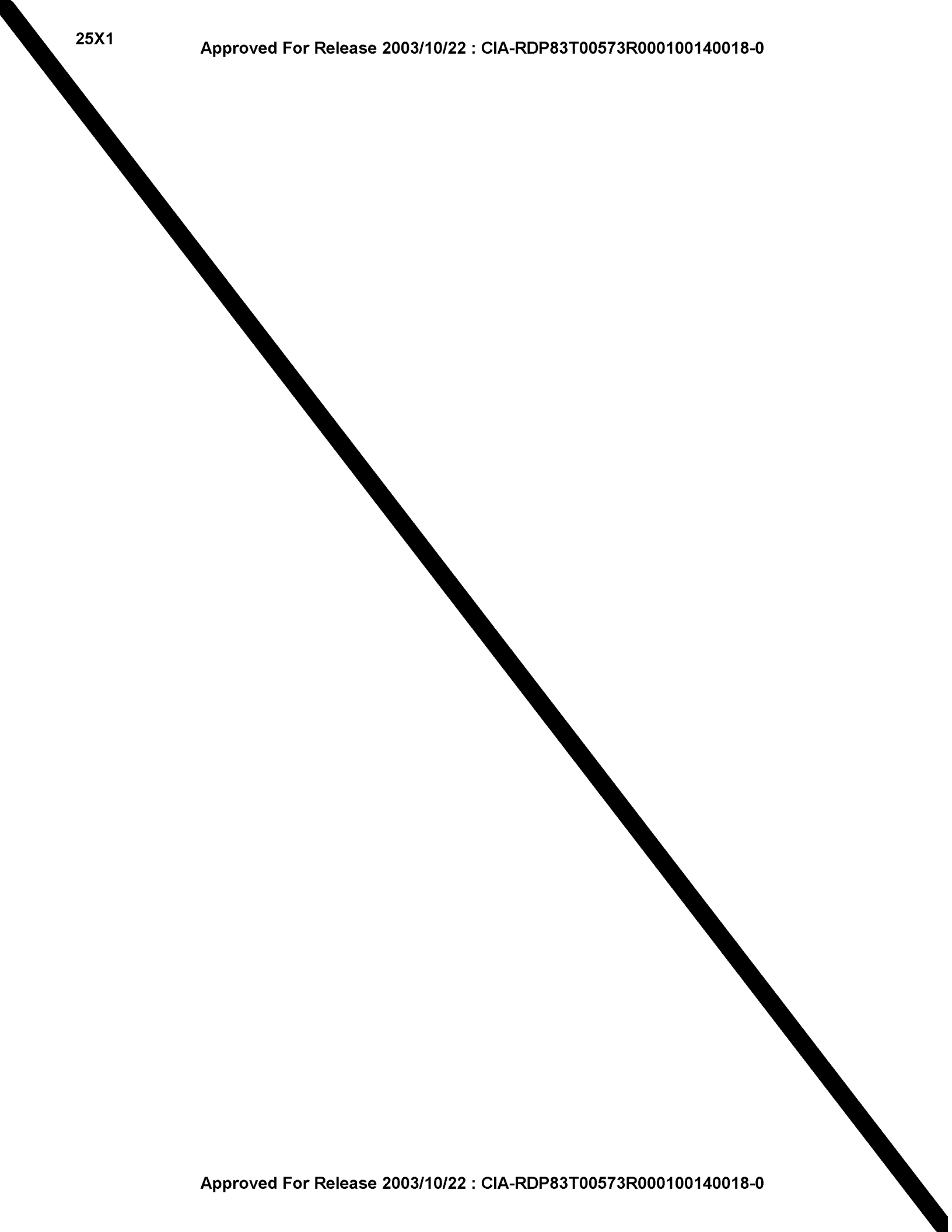

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4.6 NETWORK VIRTUAL TERMINAL (NVT)

(U) An NVT is a software description which provides a standard, network-wide, intermediate representation of a canonical terminal. This eliminates the need for "server" and "user" hosts to keep information about the characteristic of each other's terminals and terminal handling conventions. The lack of specifications for a Network Virtual Terminal (NVT) for internetwork operations will necessitate that each COINS II host implement the necessary software required to translate the characteristics of each type of terminal that will access the host into the characteristic of the host's "home terminal". Since COINS II and other networks that desire access to COINS II, are not homogenous in regard to terminal population, the amount of total network software required for the necessary translations would be quite large.

(U) Relocating this translation function to the network access points - GATEWAY, NAS, etc. - by implementing the NVT concept, would not only reduce the software and storage requirements of each host, but would also concomitantly reduce the processing time required in a given host for each transaction. Thus, the level of workload point at which a given host would start to thrash or choke would be higher. However, since the translations would still be performed, although at the network access points, the difference in network response time between these two operational concepts can only be determined by a detailed study which would include the construction of a network simulation model.

5.0 FINDINGS

5.0 FINDINGS

5.1 COINS II INTERACTIVE TERMINAL CAPABILITY

(U) In analyzing existing and planned host processors associated with/or scheduled to interface the COINS II network directly, or via a GATEWAY, ICA investigated the concurrent interactive capability of host processors for COINS user access, and the estimated numbers of interactive terminals associated with these hosts that require COINS access. Figure 5.1 provides an analysis of the processing host's allotted concurrent access capability; the estimated number of interactive terminals requiring access; and the estimated number of interactive terminals requiring concurrent access. Presently, the NSA SOLIS is the only host processor operating interactively in the COINS II network. The host processor's allotted number of COINS II concurrent interactions, when compared with the interactive terminals requiring concurrent access is negligible. In comparing the allotted access capability of the host processors to be associated with the COINS II network in 1981 (i.e., WINDMILL, DIAOLS/DISP, NDS and NSH) with the estimated number of terminals requiring concurrent access, the COINS interactive terminal population requiring concurrent access is approximately two and one-half times greater than the host processor allotted capability for COINS II users. In 1983 the estimated COINS interactive terminal population requiring concurrent access is three times greater than the host processor (i.e., WINDMILL, NDS, SAFE, NSH) allotted capability for COINS II users.

(U) Since the host processors being accessed by COINS users were initially installed to satisfy their respective Agency's mission, there are no priority systems for allocating interactive connections to COINS users accessing these hosts. A limited number of concurrent accesses have been allotted to COINS users.

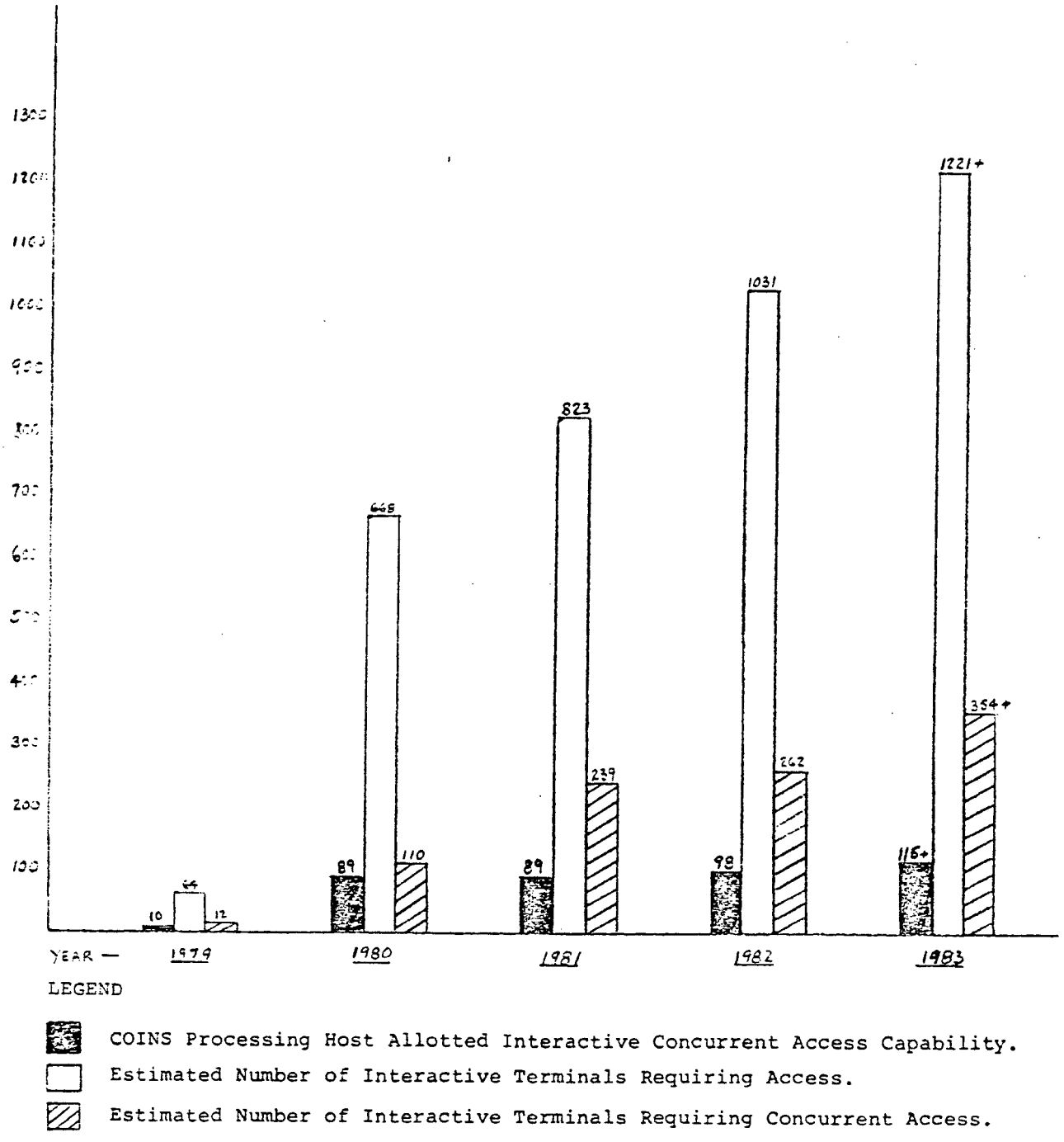


Figure 5-1. Comparison of Processing Host Allotted Concurrent Access Capability, Estimated Interactive Terminals Requiring Access and Terminals Requiring Concurrent Access

(U) Figure 5.2 provides an analysis of the estimated concurrent access capability of COINS hosts and GATEWAY facilities. It compares the direction of flow of access i.e. bi-directional, uni-directional to COINS only and uni-directional from COINS only, over the 1979-1983 time frame. When the WINDMILL HOST (SOLIS and PROJECTOR Applications) becomes operational in 1980, the "From COINS Only" direction disappears, since WINDMILL terminal will have the capability to access the COINS network. The "bi-directional" increases, immensely in 1981 with the modification to the TAS software to allow it's terminal facilities to talk to other TAS terminal facilities. The "To COINS Only" direction increases in 1983 will result from terminal facilities associated with hosts, (i.e. NMIC, SEAWATCH/IAIPS) and the PLATFORM Network.

(U) The proposed COINS II/IDHSC II GATEWAY will be the most difficult one to implement of all the proposed GATEWAYS. The reason for this difficulty is the extensive differences in network operating components--hardware and software-- between the two networks; the communications protocols are different; the networks' trunk speeds are greatly different; and the terminal devices are also different. Consequently, extensive network interface software will have to be developed for buffering and protocol or format conversion. Likewise, sophisticated equipment capabilities will be required to efficiently deal with the traffic demands.

(U) The above considerations target the COINS II/IDHSC II GATEWAY as a possible major bottleneck in the network. Large traffic volumes could possibly cause extensive queueing, buffering, or rejections at the GATEWAY. It is most imperative that a Network Engineering Analyses be made on the performance of this GATEWAY under a wide range of throughput.

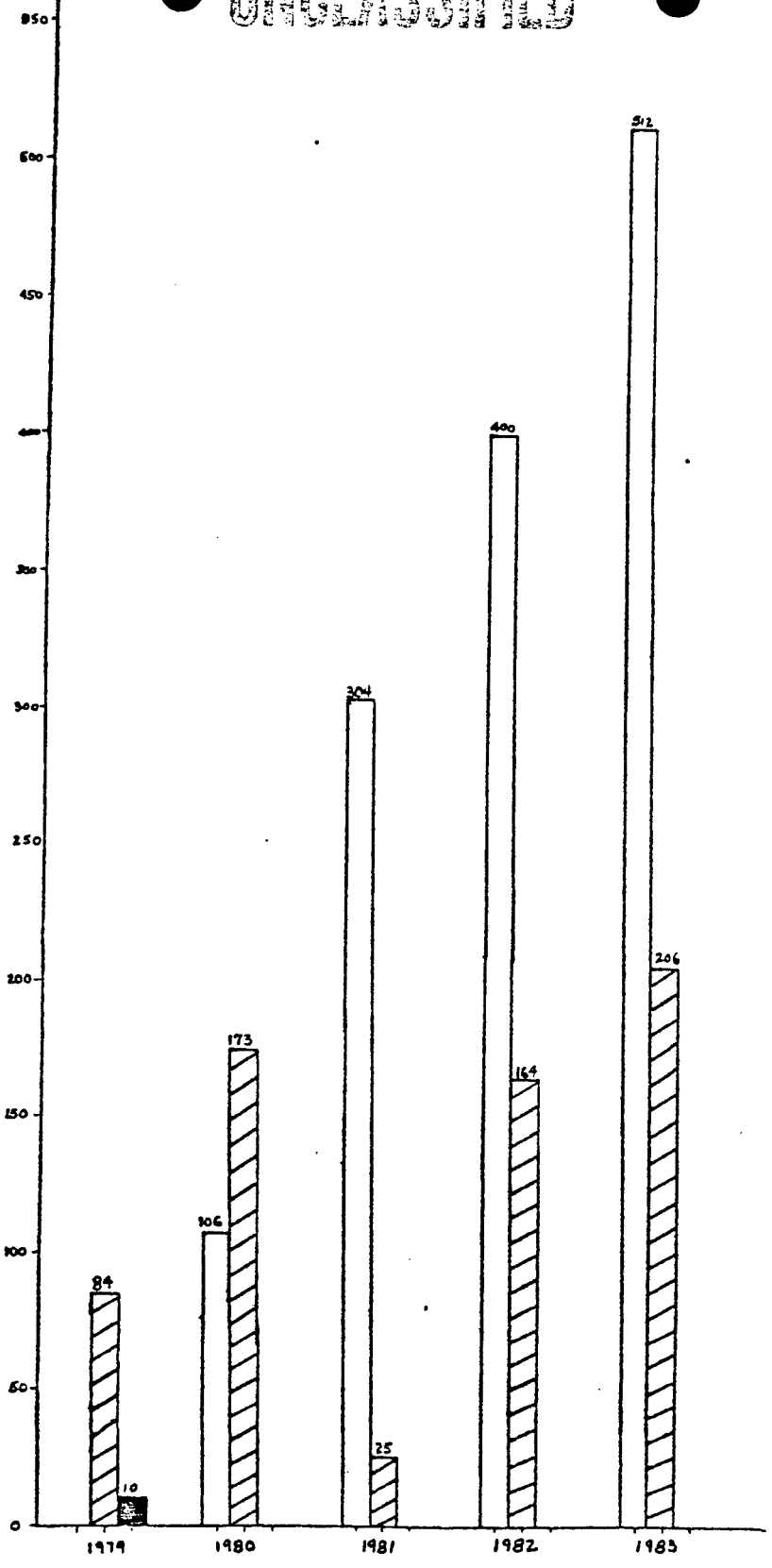
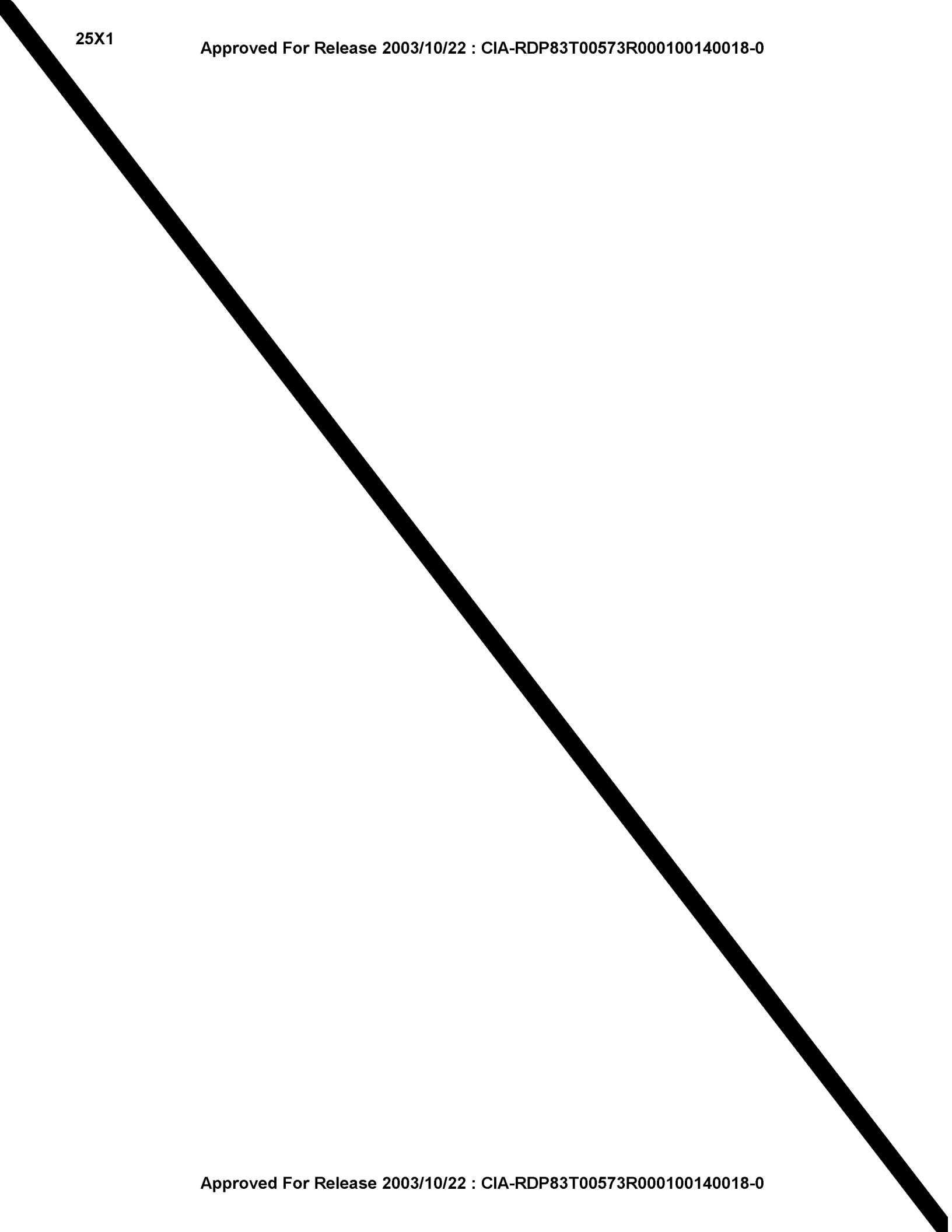


Figure 5-2. Comparison of the Direction of Flow of Concurrent Access - COINS Hosts and GATEWAY Facilities



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5.3 OPERATING LIMITATIONS

5.3.1 Concurrent User Capability

(U) The communicatons subsystem of SOLIS which is embedded in the B-7700 only accomodates 10 concurrent interactive users at the present time. This appears to be an administratively determined number. The current Frond-End (FE) associated with SOLIS accommodates a maximum of 10 concurrent users. In contrast the future WINDMILL FE serving both the SOLIS and PROJECTOR applications will be a NAS, capable of handling up to 32 concurrent users.

(U) DIAOLS (System I) currently can accommodate a maximum of 36 concurrent users. Of these, a maximum of three concurrent COINS users are guaranteed host system access by the priority algorithm now utilized. DIA concurrent connections can be utilized for additional concurrent COINS users as required. DIAOLS/DISP will maintain the same priority algorithm for twice the concurrent users.

(U) The NPIC NDS has plans to accommodate a maximum of 42 con-concurrent accesses to and from COINS. It's FE (the NAS) can accommodate up to 42 concurrent interactions.

5.3.2 Software Limitations

(U) The TAS utilizes an asychronous communications protocol that buffers and queues traffic from attached terminals. Errors due to communications problems are not detected until the software works down to the queued up information.

(U) An increase in the number of terminals attached to the TAS and the modification to allow TAS terminals to communicate with other TAS terminals, may degrade the performance of the TAS and

and ultimately effect the network response time presented to the user.

(U) SOLIS sends (1000 character) print buffer to TAS every 10 seconds per user. Under normal operating conditions, the TAS preserves the information in core memory and delivers it to the destination printer. There is no logical acknowledgement of the receipt of the information between TAS and SOLIS.

(U) The current TIPS/RYE and IIS host each acquires two computer words for a complete identification for every host, TASs and GATEWAYs. The current table lengths provides for a maximum of 15 such identifications. Enlargement of these tables is possible only through software modificaion.

5.4 BATCH MODE SUPPLEMENT TO INTERACTIVE ACCESS

(U) Except for enforceable operational rules, human psychological factors will undoubtedly rule out all except a minimal realizable reduction in "outside user" demand for interactive connections to a given host. Most users will feel that their work is most important and that they need an answer now. However, clearly not all demands for interactive access can be met at a given time. There are two principal reasons for this: firstly, there will be technical (hardware/software) reasons for a limit on the number of concurrent accesses a given host can handle; secondly, since the host was installed to satisfy its sponsoring agencies needs, the sponsoring agency has/or will put a limit on the number of "outside" accesses allowed to their host. In order to increase the workload capability of a given host and reduce the effect of reason one, a hardware/software upgrade would have to be performed with its attendant costs. Very little could be done to dilute the effects of reason two outside of the designation of an inter-intelligence community "Executive Agent" with the authority to

implement and enforce a priority system for allocating interactive connections; a course technically difficult and politically hazardous.

(U) Undoubtedly then, there exists the need for all hosts' systems providing "batch" interrogation capability as the next recourse for a user who needs an answer but cannot access the host in a demand or interactive mode. These deferred user requests might be placed in a queue on a first-in first-out basis, or perhaps the queue might be ordered on a user estimated time priority basis such as "answer needed in 2 hours" or "answer needed next day".

(U) There are two types of theoretical choke points that will govern interactive operations in COINS II; processing choke points and transmission choke points. Processing choke points center around the hosts. Transmission choke points involve the other elements of a network; GATEWAYS, TAS, NAS, FE/NCPs, etc. A problem in any element of these two types of choke points could be the factor that causes system degradation when certain volumes of traffic are encountered. The utilization of some hardware/software modules of the network's components does not vary uniformly with load changes. Queues build up; storage/buffer areas become filled; and pathways may be occupied.

(U) There is no way of accurately forecasting when and where a choke point will occur under the actual operating conditions of COINS II unless two interconnected studies are undertaken. First, an accurate determination of the user requirements must be conducted. Second, analytical studies must be performed using a range of throughput values--both less than and greater than the forecasted values determined by the requirements study. The analytical studies would utilize the information contained in the Network Engineerng description as their data base.

5.5 COINS MANAGEMENT IMPLICATIONS

(U) The previous sections have demonstrated a significant expected growth in the number and type of systems which will be accessing the COINS network. COINS will have to accomodate an ever increasing set of users whith growth and changing requirements over time. This expected growth in the number of accessing systems and terminal population provides a complex management environment for the COINS PMO. COINS network planning and management will have to accommodate the increased demands for service while avoiding potential bottleneck situations at many different levels.

(U) In order to cope with the COINS network planning and management, the COINS PMO needs to acquire and maintain detailed technical and requirements information on those systems that will be interfacing with and accessing the COINS network. This detailed engineering description must include the latest information on system hardware, software, system attributes related to accessing restrictions from other COINS users, and requirements estimates for accessing other systems through COINS. It is essential that such a data base be established and maintained for all participants in the COINS network in order to:

1. Determine potential system limitations (bottlenecks) at all levels;
2. Determine appropriate modifications and the resources required to remove such system limitations;
3. Plan the long term evolution of the COINS network and estimate its resource requirements;
4. Inform and advise users of the COINS network's ability to satisfy their interaction and accessing requirements;
5. Inform and advise users of the expected level of demand for access to their systems through

the COINS network and possible limitations of current configurations;

6. Manage the introduction of new users and determine appropriate procedures for entry into the COINS network.

(U) The most effective manner in which the COINS PMO could manage the growth of the network services would be to install a COINS Management Information System (CMIS). A CMIS would have essentially three major elements:

(a) A data base containing a detailed engineering description of network and user hardware, software and performance characteristics affecting the COINS network and its services.

(b) Projected requirements of individual user systems and networks for interaction with other systems/networks served by COINS II,

(c) A set of analysis programs to assist the COINS PMO to project the effects of service demand and changes in the engineering characteristics of the network and/or its users, and to determine the most cost effective means of providing the required level of service.

(U) The detailed engineering description must include those characteristics of COINS II participating systems/networks that will effect the major measures of capacity, throughput, availability and cost. The characteristics of importance include hardware and software specifications, processing times as a function of system loading, data "packet" formats, segment functions and lengths, reliability of system elements, processing/protocol restrictions or constraints, error characteristics and baud rates of communication circuits, etc.

The requirements data should be analyzed in terms of such a detailed engineering description of the current COINS network. Given an accurate representation of the capacities of the elements of the network and the effects of their mutual enteraction, it will then be possible to accurately identify the nature, location and loading effects and likely to be experienced as a result of new user reports.

(U) The size and expected growth of the COINS network has proceeded to the point where CMIS would appear to be the appropriate mechanism for continued growth management and long range planning assistance.

6.0 RECOMMENDATIONS

6.0 RECOMMENDATIONS

(U) Consideration of the findings presented in the previous section, in conjunction with more specific technical findings detailed in the subject report, lead to the following major recommendations:

1.(U) The COINS PMO should take action to expand the capacity of the COINS network, associated host processors and Front-End Processors/GATEWAYS to meet the projected requirements for concurrent interactive access.

The significant projected gap between allotted and required concurrent access can only be closed through modifications and extensions of existing hardware and software, changes in policies related to access restriction, and management of the introduction of new user and service improvements. Initial steps should include the expansion of the capacity of the WINDMILL NAS, the SOLIS and PROJECTOR communications software. Software changes/improvements should be introduced to allow limited interaction between NDS terminals and the SOLIS and PROJECTOR systems, conversion of NAS batch protocols to PROJECTOR transaction protocols (and vice-versa), implementation of synchronous operations between the TAS and its terminals, and implementation of a logical acknowledgement between TAS and SOLIS.

2.(U) The COINS PMO should investigate the possibility of instituting a priority system for allocating COINS II access capability under appropriate conditions.

The current allotment of external access capacity to particpating COINS II host processors and networks has been established on a largely arbitrary basis. There is considerable likelihood that

backlogs will occur under peak demand situations, such as crises, because of existing non-technical limitations. A study should be made of possible effective methods of alleviating such backlogs through the establishment of a system of priorities to promote the effective use of existing allotments and to consider the extension of access capacity under prescribed conditions.

3.(U) The COINS PMO should undertake the development of a COINS Management Information System (CMIS) to provide support in the management of network growth, plan for the provision of improved services and avoid the creation of network choke points.

Significant increases in demand for COINS II network services are projected for both the near and long term. No accurate planning method exists for projecting the effects of increased demands or for determining the most cost-effective way of providing needed services. A CMIS, consisting of a detailed engineering description of the COINS II network, projections of specific user requirements for interactive access and analytic tools for the examination and solution of network engineering problems is essential to efficient management of COINS II growth. Without such a capability COINS II may, itself, become a choke point in the larger network of intelligence-related information/communication systems.

4.(U) Consideration should be given to eliminating the proposed COINS II/IDHSC II GATEWAY and establishing an interim capability until the completion of the GATEWAY between COINS II and AUTODIN II.

The proposed COINS II/IDHSC II GATEWAY will be extremely costly and technically difficult to complete. It would provide a unique interconnection only until 1981, the scheduled

operational date for the COINS II/AUTODIN II GATEWAY, which would provide a service capability for the same user community. The COINS II/AUTODIN II GATEWAY will be much simpler and less costly to complete due to the networks' similarities in technical characteristics and communication protocols. An interim capability can be provided to serve IDHSC users through the installation of TAS equipment until the AUTODIN II GATEWAY is available.

5. (U) COINS II host processor systems should be modified to provide for batch interrogation as a backup capability where interactive access is restricted.

Significant potential exists for interactive access capacity into specific host processors to be fully utilized in peak situations, causing delays and backlogs. The availability of batch interrogation capability would provide an alternative means for users who need access but cannot access the host in a demand or interactive mode. Deferred user requests might be placed in a queue on a first-in, first-out basis, or perhaps the queue might be ordered on a user-estimated time priority basis, such as "answer needed in 2 hours" or "answer needed next day".

6. (U) The COINS PMO should undertake a design study of TAS capability expansion to determine the potential performance impact of the planned extension of TAS terminal capacity and the accessing of TAS terminals by outside users.

Current plans exist for expanding the number of terminals handled by a TAS from 32 to 64. At the same time, plans are for TAS terminals to be accessed by other COINS II user networks. Performance capabilities of the TAS may be seriously degraded in such an extension of capability due to significant increases in system overhead and effects on the operating system. A design-oriented study is needed to determine the extent to which such an expansion of capability could be made, the changes needed to accommodate this expansion, associated costs and the effects on TAS performance under various load conditions.

APPENDIX A

SOURCE DOCUMENTATION

SOURCE DOCUMENTATION

1. CSC Report No. SD-77/4132, "Gateway Techniques for Interconnect of Digital Networks", (Draft) (16 December 1977).

2. COINS II Front End Processor Systems (Second Draft), 8 February 1978, H. Kinslow Associates.

3. Bolt, Beranek & Newman Report No. 3908 (August 1978), "Design Specification for the COINS II/ARPANET Gateway".

4. BBN Report No. 3932 (September 1978), "A Supplement to: Design Specification for the COINS II/ARPANET Gateway".

5. COINS PMO (3 November 1977) - "COINS II-Phase I Network Upgrade Completion Report".

6. "COINS II Network Development Plan through Fiscal Year 1980", Section II - Protocols & Services, Kinslow Associates (24 July 1978).

7. "COINS II Network Development Plan through Fiscal Year 1980", Section I - The Network Configuration, Kinslow Associates (15 June 1978).

8. "Adoption of Transmission Control Protocol by COINS II", Kinslow Associates (24 July 1978) (First Draft).

9. COINS PMO - "Technical Development Plan for the Technology Transfer Research Facility (TTRF)" May 1978.

10. "The NPIC NDS System as a COINS II Host", Kinslow Associates (10 May 1978).

11. "Intercommunication of TIDE/PREFACE and the COINS II Network", Kinslow Associates (11 April 1978).

12. "Final Technical Development Plan for the COINS/ARPANET Test", Kinslow Associates (26 April 1978).

13. Draft - "Internetwork Protocol Specification", Version 4, (June 1978), Jonathan B. Postel.

14. "Specification of Internetwork Transmission Control Protocol", TCP Version 4, June 1978, J.B. Postel.

15. "The COINS II Network Service Host", A Plan for Development, (Second Draft) Kinslow Associates (8 March 1978).

16. "COINS Principals of Operations", Operational Procedure, Number 6 - 1974, (1 September 1974).

17. "Adapt I Uniform Data Language (UDL): A Final Specification", Defense Advanced Research Projects Agency, (30 January 1978).

18. COINS Terminal Access System, "Access Authorization File Maintenance" USERS MANUAL (30 January 1978).

19. COINS Terminal Access System, USERS MANUAL (30 January 1978).

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21. Conversational Operations of Coins, Kinslow Associates (March 1976).

22. COINS II as a Conversational Network, Kinslow Associates (May 1978).

23. A COINS II/AUTODIN II Transition Plan, H. Kinslow Associates (17 October 1977).

24. Installation of a COINS Terminal Access System at the Information Science Center, H. Kinslow Associates, (Draft).

25. Bolt, Beranek & Newman Report No. 1822, Interface Message Processor - Specifications for the Interconnection of a Host and an IMP, Revised 11 May 1978.

26. ARPANET Protocol Handbook, NIC 7104, Revised January 1978.

27. "System Performance Specification for AUTODIN II Phase I", Defense Communications Engineering Center (February 1977).

GLOSSARY

ADCOM	-	Aerospace Defense Command
ADS	-	Automated Document System (State Department)
ARPANET	-	Advance Research Project Agency Network
ATSS	-	Analytic Terminal Support System
AUTODIN	-	Automatic Digital Network
BLACKER	-	An NSA R & D Experimental Project
BROF	-	NSA B-Group Remote Operating Facility
CAU	-	Command/Arithmetic Unit
CIA	-	Central Intelligence Agency
CNCC	-	COINS Network Control Center
COC	-	Collection Operations Center
COINS	-	Community On-Line Intelligence System
COMSEC	-	Communications Security
CPU	-	Central Processing Unit (of a Computer)
CRT	-	Cathode Ray Tube (Terminal)
C/SP	-	Communications Symbiont Processor
DCA	-	Defense Communications Agency
DDCMP	-	Digital Data Communications Message Protocol (DEC)
DEC	-	Digital Equipment Corporation
DEFSMAC	-	Defense Space & Missile Analysis Center
DFAC	-	Direction Finding Activity Center
DIA	-	Defense Intelligence Agency
DIAOLS	-	DIA On-Line System
DISP	-	DIAOLS Improved Service Program
DODIIS	-	Department of Defense Intelligence Information System
DSSCS	-	Defense Special Security Communications System
FE	-	Front-End (Processor)
GWY	-	GATEWAY
IAIPS	-	Integrated Automated Intelligence Processing System

IDHSC	-	Intelligence Data Handling System Communications
IIS	-	Integrated Intelligence System
IMP	-	Interface Message Processor
INI	-	Intelligence Network Interface
INR	-	Intelligence and Research Division (State Department)
ISC	-	CIA Information Science Center
LLL	-	Lawrence Livermore Laboratories
NAS	-	Network Access System
NCP	-	Network Control Program
NDS	-	NPIC Data System (U-1100 Computer System)
NMIC	-	National Military Intelligence Center
NMIS	-	Network Management Information System
NMSS	-	Network Monitoring Subsystem
NOSC	-	Naval Ocean System Center
NOSIC	-	Naval Ocean Surveillance Information Center
NPIC	-	National Photographic Interpretation Center
NSA	-	National Security Agency
NSH	-	Network Service Host
NSOC	-	National SIGINT Operations Center
NUISS	-	Network Usage Information Subsystem
PACOM	-	Pacific Command
PLATFORM	-	An internal NSA packet switch network
PLATO	-	Programmed Learning and Teaching Operations
PLI	-	Private Line Interface
PROJECTOR	-	An application on a host (B-7700) at NSA
SAC	-	Strategic Air Command
SAFE	-	Support for the Analysts File Environment
SEAWATCH	-	A NOSIC host computer (CDC 6400)
SIGINT	-	SIGNAL Intelligence
SIP	-	Segment Interface Protocol
SOLIS	-	SIGINT On-Line Intelligence System (an application on a B7700 host computer at NSA)

TAS	-	Terminal Access System
TCP	-	Transmission Control Protocol
TIPS/RYE	-	An NSA host computer
TPU	-	Terminal Processing Unit
TTRF	-	Technology Transfer Research Facility
USISS	-	User Support Information Subsystem
WINDMILL	-	An NSA host computer (B7700) that contains the SOLIS and PROJECTOR applications

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Coordination		Justify			

REMARKS

Mr. Johnson,

Recently, you requested a copy of a draft COINS report "Problems Associated with Accommodating Interactive Hosts in COINS II. The COINS PMO just forwarded the final version of the report.

From CIA's point of View: sections 2.3.2.1 and 3.4 discuss NPIC; 2.3.5.2 and 5.1 Project SAFE; 2.3.2.8 and 4.2 [redacted] and 2.3.3.1 The Information Science Center. As an interesting sidelight 2.3.2.2 discusses State cables on COINS.

Again, despite the original distribution on this report, I simply do not recall ever receiving it. I have also forwarded a copy of the report to [redacted]

Tom

Tom

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